THE

NATIVE FLOWERS AND FERNS

OF THE UNITED STATES

IN THEIR BOTANICAL, HORTICULTURAL, AND POPULAR ASPECTS.

BY

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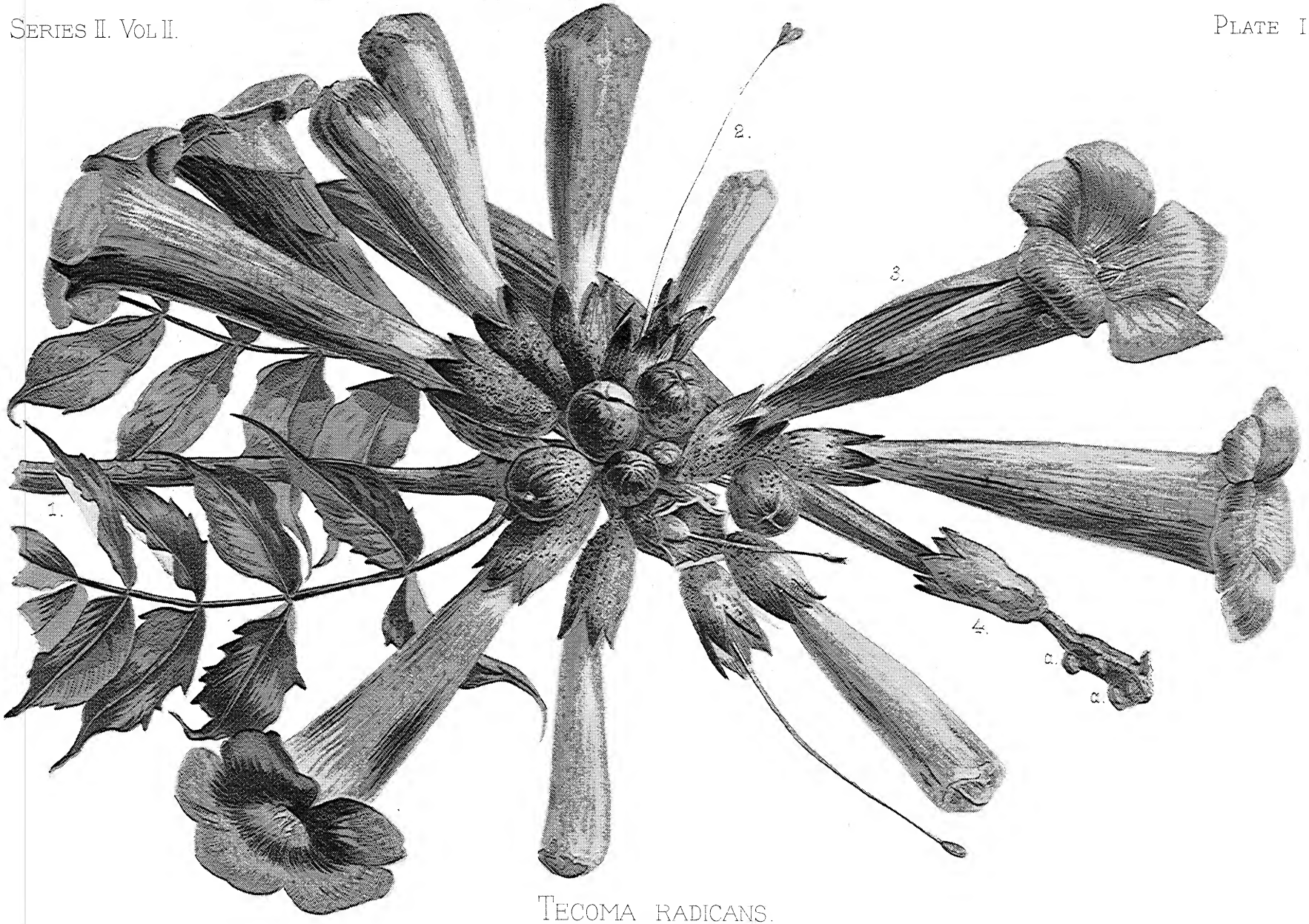


TECOMA RADICANS.

TECOMA RADICANS.

TRUMPET-FLOWER.

NATURAL ORDER, BIGNONIACEÆ.

TECOMA RADICANS, Jussieu.—Climbing by stem rootlets, leaves unequally pinnate, leaflets four or five pairs, ovate, acuminate, dentate-serrate, puberulent beneath along the veins; corymbs terminal; corolla tube thrice longer than the calyx; stamens included. (Wood's *Class-Book of Botany*. See also Gray's *Manual of the Botany of the Northern United States*, and Chapman's *Flora of the Southern United States*.)

THE Trumpet-flower, Trumpet-vine, or Trumpet-creeper, as it is variously called, is among the best known of our wild flowers. There are but few who have not seen it, and yet how very little is known of the many points of interest it possesses.

In the times just preceding Tournefort, when botany as a system was in a transition state, it was regarded as a sort of Jasmine. Tournefort uses the name of *Bignonia*, and this was adopted by Linnæus, in his "Genera Plantarum," from which modern botany dates. A. L. De Jussieu, who, in 1789, issued a Genera Plantarum "according to natural orders," and is regarded as one of the great fathers of the modern natural system, as distinguished from the sexual system of Linnæus, was the first to separate it from *Bignonia*, giving it the name of *Tecoma;* abbreviating, as he tells us, the Mexican name of "Tecomaxochitl," which according to the Spanish writer, Hernandez, is the name given there to some species of the genus. This hard word is really two in the Mexican language, and means "Pitcher-flower," the pitcher being of a peculiar shape, the commentators tell us, and "used in war." But it is now believed that the Aztec "Tecomaxochitl" referred to by Hernandez, is a plant of the

Solanum family—*Solandra quttata.* In botany, however, it is not usual to alter names, though given in mistake; for a name that has no meaning or application is just as good as any other, and it is better to endure these occasional slips in intention, than to increase lists of synonyms.

The botanical difference between *Tecoma* and *Bignonia*, as defined by Jussieu, is chiefly in the seed vessel. In *Bignonia* the valves are parallel with the partition which divides the capsule, while in *Tecoma* they are contrary to the partition. The natural order receives its name from *Bignonia*, and in this relation our Trumpet-flower affords an interesting study; and it will show that even what are called natural orders or great families of plants are often divided by what may be regarded as very slender threads. If we compare this flower with some in other allied orders—say, for instance, *Mimulus* or *Pentstemon* of the order *Scrophulariaceæ*, the student will find numerous points of resemblance. In many flowers we find a coincidence in the number of the floral parts. If, for instance, we find a flower of five sepals, we look for five petals, five (or possibly ten) stamens, and it may be a pistil with five divisions. If there be a less number in any of these series, we look for abortion or consolidation. *Bignonia* has a five-parted calyx, a five-parted corolla, but we find only four perfect stamens. Theoretical science tells us there should be five, and on looking for this number we can trace it in the flower. We may note the same abortion of parts in some of the *Scrophulariæ*, and in *Pentstemon* the abortive one is so far developed as to suggest the botanical name. Again we find the pistil terminated by two thin lobes, and it is the same in *Mimulus*, and then, also as in *Mimulus*, these lobes when expanded close together when touched. Indeed botanists recognize few very important divisions between these two great orders, except that in *Bignoniaceæ* the seed has no albumen, and thus has to send a rootlet at once into the earth on the germination of the seed in quest of food; while in *Mimulus* the embryo is enclosed in albumen on which the plantlet can feed till full roots are formed.

The reference to the sensitive lobes of the stigma brings before us the question of cross-fertilization by insect agency, to which this sensitiveness in some flowers has been supposed to have some relation. It is believed that an insect, in search of honey, with pollen on its back, would rub against the expanded lobes, which would close before the insect left the flower, thus preventing the reception of its own pollen. In the case of our Trumpet-flower, the lobes close very slowly. In cases observed by the author, they were not completely closed in thirty seconds. The bumble-bee visits the flower only for pollen, so far as the writer can trace. The flower is barely open before the pollen sacs burst, and these are immediately rifled of their contents. The lobes do not expand till after the bees cease their visits, but a portion of the pollen falls on the stigma as the sacs open, and a few grains may find admittance to the stigmatic surfaces through the clefts as the lobes open. Humming-birds enter the flowers for their sweets, occupying from five to ten seconds in each flower. It is possible they may aid in cross-fertilization, but the author has never been able from actual observation to trace just how much, if any, aid may be derived from this source. It is very likely that some phase of nutrition affects productiveness rather than matters connected with pollen from other flowers, for in Pennsylvania we find it is only the flowers which open latest that usually produce seed, as we see in our Fig. 4, where all the early flowers were infertile. In the plants observed by the writer, large numbers of flowers are often seen with the tubular portions split, as in Fig. 3, but by what agency he has never clearly discovered.

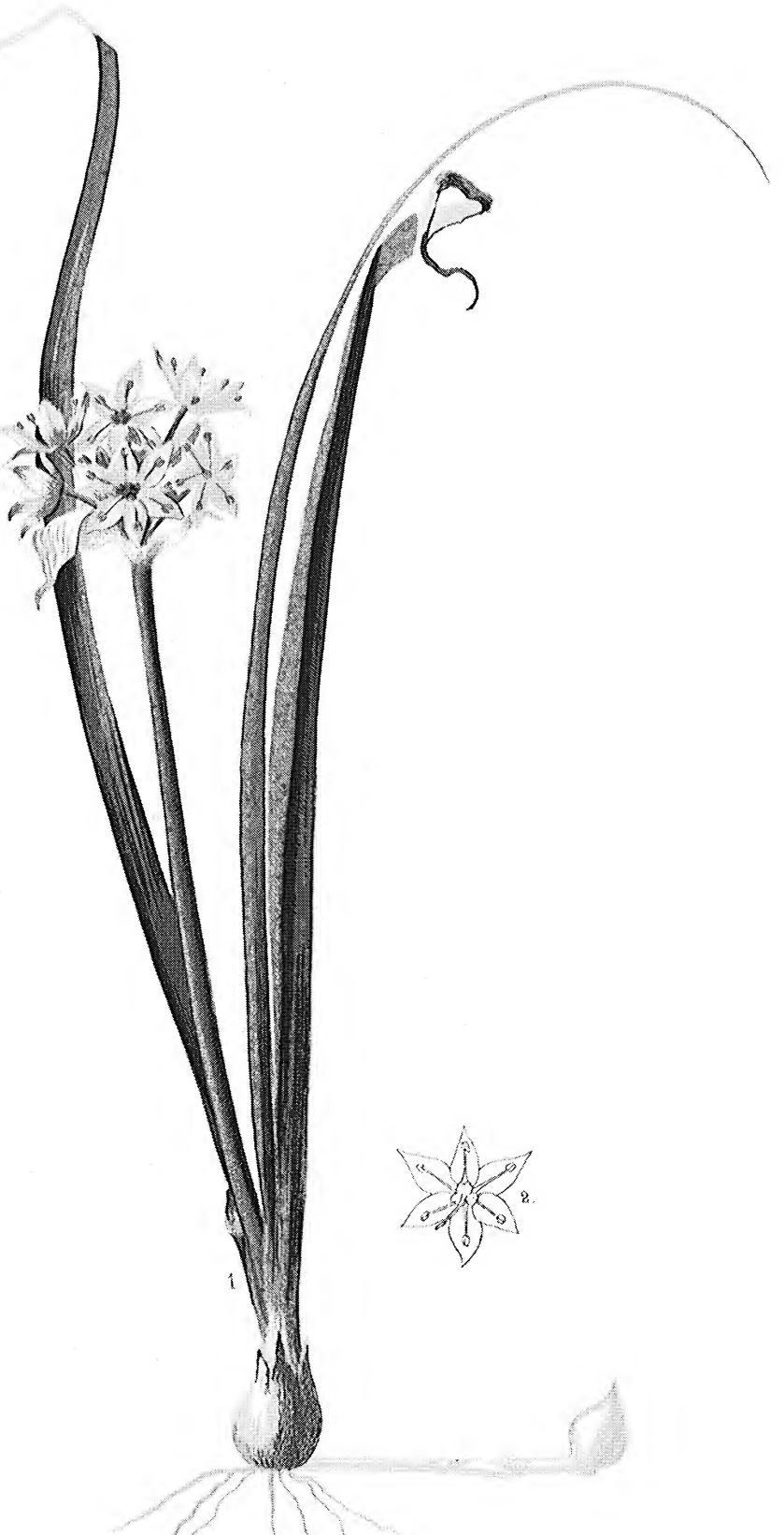
Our drawing is from its most northern locality, near Philadelphia, but it is seen in its greatest beauty in the rich alluvial soils along rivers in the Southern States. A lovely sight in a piece of rich woods along the Missouri river, above St. Louis, in which these flowers figured chiefly will ever be remembered. Southwardly from the Gulf of Mexico

"——soft gales
Stole from a peaceful ocean, whose bright waves
Rolled gently into music, and they blew
Through woven trellises of all-sweet flowers,
And sported round long wreaths of festooned vines
Hung with the gayest blossoms,——"

and the beautiful tropical scene, as imagined by the poet Percival, seemed more than realized in these magnificent Trumpet-vines, as their wreaths and festoons hung with myriads of gay blossoms, swung at the loftiest heights from tree to tree.

The genus abounds in the tropics,—our species is confined to the southern portion of the United States, reaching the mouth of the Delaware, and going but very little beyond the Mississippi river. In the Pennsylvania locality it is in the height of its beauty about the month of August.

EXPLANATION OF THE PLATE.—1. Flowering branch. 2. The pistil with its bilobed stigma. 3. Corolla showing the torn tube. 4. Immature capsule, at the end of the rachis, the scars *a a* showing where the infertile flowers had been.



Allium Palmeri

L. Prang & Company, Boston

ALLIUM PALMERI.

PALMER'S ONION.

NATURAL ORDER, LILIACEÆ.

ALLIUM PALMERI, Sereno Watson. — Reticulation irregular, sub quadrate, the cell outline minutely very sinuous; scape eight inches high, rather stout; leaves narrow-linear; umbel many-flowered, the spreading pedicels six lines long; sepals more or less deep rose-color, three to four lines long, acute, erect-spreading, exceeding the stamens. (Watson's *Botany of the Geological Exploration of the fortieth parallel*, under Clarence King.)

HEN the reader who may not be well acquainted with botanical classification understands that the onion is an *Allium*, and that *Allium* is a genus belonging to the great order of *Liliaceæ*, or the Lilies, he will perhaps be startled by the association. Oftentimes appearances so favor classification, that the popular mind can scarcely err in its impressions. It would unite what the botanists would join all in one family. But there are some so closely related, that botanists can hardly find any reasons for separating what the average observer would never bring together; and this case of *Allium* among the Lilies is one of these. And yet popular resemblances have to be respected to a certain extent even in botany, and thus such plants as the Tulip and the Lily, though held under the Liliaceous order, are placed in a separate subdivision from that in which the onion is held. The former is known as the *Tulipæ* section, while the latter is in the *Scillæ* or squills, and yet when botanical science looks for some great dividing line between what in appearance is so distinct, little more can be found than this, that while in the *Tulipæan* section the anthers fall from the filaments on a light touch, in the squills they are so firmly fastened, that all parts of the stamen fade away together. The *Liliaceæ* constitute one of

the largest orders in the vegetable kingdom. It is divided into numerous subdivisions besides the two named, but the *Scillæ* to which the *Allium* belongs constitute one of the largest divisions, and though they have few, if any, that can compare in gorgeous beauty with the *Tulipæ* or true Lilies, they have a peculiar beauty of their own, which gives them an interest by no means inferior in many respects to that of their gayer neighbors.

Many of the *Alliums* are only known for their culinary uses. This is the case with the onion, leek, shallot, and similar plants, all belonging to this genus; but many of them are very ornamental, and are much sought for by cultivators expressly for their beauty. Some of them have been known from great antiquity, and the name is found both in Virgil and Pliny.

Milne, who wrote soon after the time of Linnæus, tells us that the name *Allium*, as used by these old Roman writers, was borrowed by them from the Greek "*allo*, to shun or to avoid, from its disagreeable smell which is generally avoided;" but modern writers follow Theis, who says it is "derived from the Celtic *all*, which signifies acrid or burning," as some of the roots are.

As is the case with so many of the plants known to the ancients, one of the species, *Allium Moly*, gained an entrance into the imaginative poetry of the times. This Moly was said to have been an Arcadian of obscure birth, but a veritable natural genius, and especially gifted with the power to cure people of witchcraft. Mercury found him out, and set much store by his knowledge. He cured immense numbers, and finally dying mourned by the people, at their urgent request Mercury turned him into this flower, so that in this condition at least he might live as long as the world endured. Botanically the name is credited to Linnæus as adopted from Tournefort, who preceded him in authoritative botanical literature; but the name in connection with these plants was in use by Bauhin a hundred years before, and probably by others still prior to his time. The number of species, large as it is, is continually being increased, and the present is one of the most recent discoveries. It was named

Allium Palmeri by Mr. Watson, after Dr. Palmer, of Davenport, Iowa, who is at the present time one of the most zealous investigators of the flora of the little known portions of the United States, and who collected the specimens in southern Utah in 1870, from which the species was subsequently described and named by Mr. Watson in the work cited at the head of our chapter. It was again collected by Dr. C. C. Parry in the high mountains east of Cedar City, in southern Utah, flowering then in July, 1874. Mr. Watson remarks in describing it, that it had probably been seen before by other explorers, notably by Dr. Newberry, near Fort Defiance. Our drawing was made from roots collected by Dr. Palmer, and flowering in the collection of the Arnold arboretum under Mr. Jackson Dawson's care. It has also flowered in the garden of the writer, at Germantown, Philadelphia, from roots kindly sent by Mr. John Reading, of Salt Lake City. It seems to thrive very well in the open ground here under cultivation, and is a very ornamental hardy plant. As a type of beauty it would hardly occupy a high place, for the scape is too short to proportion well with the leaves; but still, as a lady critic remarked, "it is too pretty to be an onion." Much of its attractiveness is of course due to its rosy color, but as will be seen by the ground-plan (Fig. 2.), there is a great deal in the harmonious proportions of the lines in the various parts of the flower, that will commend it to those looking for natural models in ornamental designs.

Botanically there is much to interest the student in a special examination of this plant. In the description it will be noted that Mr. Watson says, the "cell outline is minutely very sinuous." This refers to a discovery by Mr. Watson, that the outline of the cells when a portion of the leaf is held up to the light, or examined with a lens, is seen to vary much in the outline, and that this variation is characteristic in the different species. He gives drawings of the outlines of several in the work from which the botanical description is taken, and the outline of this one is minutely sinuous or "snaky," while those of other species are very deeply lobed.

Another botanical feature of interest relates to the manner in which the new bulb is formed. In many species of the onion family the main bulb seems to divide, and the new ones for next year seem to be made up from these sections of the old one of the previous year. This is owing generally to the fact that the buds come up from between the scaly coatings which form the bulb. In the case of *Allium Palmeri* the new buds are formed from the very base and outside of the coatings of the old bulb, and these push out several inches horizontally from the parent, which probably dies after its flowering work has been fully perfected.

Its central home is probably southern Utah, but exactly how far it spreads has not yet been fully made known.

EXPLANATIONS OF THE PLATE. — 1. Complete plant in flower. 2. Ground-plan or full-face view of a single flower. 3. New bulb being formed for the next year.

NEVIUSIA ALABAMENSIS.

L. PRANG & COMPANY, BOSTON.

NEVIUSIA ALABAMENSIS.

THE NEVIUSIA.

NATURAL ORDER, ROSACEÆ.

NEVIUSIA ALABAMENSIS, Asa Gray.—Calyx bractless, spreading, five-parted, with the lobes leaf like, incisely serrate and persistent. Corolla none. Stamens indefinite, inserted in several rows on the thin disk which lines the bottom of the calyx; filaments filiform. Ovaries two to four, sessile: style nearly terminal, filiform. Ovule single, pendulous, anatropous. Achenia drupaceous. Cotyledons oval, flat. Embryo included in thin, fleshy albumen. Radicle superior, inflexed—accumbent. (Chapman's *Flora of the Southern United States.*)

THE pretty plant we now illustrate has more points of interest than is usual with our wild flowers. Up to 1857 it was wholly unknown, and it has not been found in any other place than where it was originally discovered. It was detected in the year mentioned, by the Rev. Dr. R. D. Nevius, a missionary of the Protestant Episcopal Church, and an ardent and acute botanical observer. Noting that it was different from any plant described in botanical works, he sent specimens to Dr. Asa Gray, who found that it was not only new, but represented an unknown genus, which he named *Neviusia*, after the discoverer, and *Alabamensis*, from the State in which it is even yet only found.

In a letter to the author, written in 1877, Dr. Nevius gives some interesting facts regarding the location of the discovery. He says: "I first noticed it, I think, on the North river, an affluent of the Black Warrior, a short distance above Tuscaloosa, in Alabama, and at its mouth. It grew in a dense thicket in the first loose soil under a long cliff of rock which is exposed by the wearing away of the bank. It has a southern exposure at that place, and grows about seventy-five or one hundred feet above the level of the plain or bench below. As its habit is to make

new growth in long virgate branches from the root, like the *Spiræa*, the thicket when in full flower looks like a snow-wreath under the cliff. I have seen there a spray of two feet long, and have grown the same in the church-yard of Christ church, Tuscaloosa. It blooms there as early as February 27th, and on account of its early flowering and easy propagation from underground stems it is a valuable ornamental shrub. The flowers which are produced in axillary umbels have very delicate, showy stamens only. The calyx is comparatively large, and very similar to the stem leaves in outline and serration. In fair weather it vies with the best of the *Spiræas*, but a slight storm of rain spoils its beauty by gumming the stamens, which are perfectly white with yellow anthers, to the calyx."

Being so rare in its native State, it has not yet had time to get among the people and thus receive a popular name. One of its allies, *Spiræa Reevesii*, is known in gardens as the "Bridal Wreath," and when we read the graphic account Dr. Nevius gives of its early snowy whiteness among the plants, which in the language of Percival,

> "—— love
> The rude rock, and the frowning precipice,
> The winding valley, where it lies in green
> Along the bubbling riv'let,——"

it would seem not inappropriate to suggest for this the popular name of "Alabama Snow-wreath," but it may be best to make but the bare suggestion here.

After all, it is a question whether it is really confined to Alabama, and to this one small spot on the earth's surface. The Southern States have not been thoroughly explored by botanists. New species are continually being discovered, and it is as possible to find new stations for species already known. It will give much zest to botanical excursions in that region to keep the possibility in mind. At any rate the plant must be scarce, and this fact excites the inquiry, which other rare plants do, whether or not they are the last living representatives of a race once abun-

dant—for it is hardly to be supposed the species never had a wider range; nor is it probable a form so distinct from any of its geographical neighbors is a new creation.

This distinctness from others is indeed one of the features which give it so much interest. Though in Dr. Nevius' account it is compared with *Spiræa*, a member of the order *Rosaceæ*, Dr. Gray regards it as occupying a median place between this order and that of *Saxifragaceæ*. But, after all, there is not a very great difference between the Roses and the Saxifrages. One of the chief differences is that in the Rose family the pistils are separate from one another, while in the Saxifrages the lower portions (the ovaries) are at least united. The Roses are also characterized by a large number of stamens as compared with the Saxifrages, and they have stipules, or small leafy processes, at the base of the perfect leaf, which the Saxifrages have not.

To the general observer a striking peculiarity in the genus will be the calyx, the five leaves of which, or sepals as they are botanically called, are similar in form and character to the normal leaves on other parts of the plant. It is now so thoroughly believed that the sepals, indeed all the parts of a flower, are nothing but leaves changed in character when in a very early stage of development, that it is taught as an undoubted law in botany. If there were yet any permissible doubt of the fact such lessons as this from *Neviusia* would settle the question. As this is a very characteristic feature of the genus, we have given in Fig. 2 a back view of a flower, so that the calyx leaves may be clearly seen. Another curious feature is the absence of the petals—those organs which give the chief charm to so many members of the Rose family. The beautiful bright-colored petals of flowers in general have been assumed by some to have been created expressly to attract insects, and thereby insure a supposed necessary cross-fertilization. If this were an undoubted law, one might be pardoned for believing that the absence of a corolla in this plant had indirectly led to its near extinction.

As a matter of classical purity in orthography, it may be noted

in regard to the naming Dr. Gray says: "His (Nevius) name is so nearly like that of the celebrated Roman poet, for whom I presume the learned Swedish mycologist has named the genus *Nævia*, that I must needs Latinize it in an unclassical but not wholly unprecedented manner," and he further adds, "Dr. Nevius wanted it named in honor of his friend, Dr. Toumey, but Dr. Harvey had named an Algæ for him."

EXPLANATION OF THE PLATE.—1. Branch. 2. Back view of a flower.

PELLÆA ORNITHOPUS.

L. PRANG & COMPANY, BOSTON.

PELLÆA ORNITHOPUS.

BIRD ROCK-BRAKE.

NATURAL ORDER, FILICES.

PELLÆA ORNITHOPUS, Hooker.—Stem tufted, three to six inches in length, rigid, erect, polished, dark chestnut-brown, naked; frond four to six inches in length and two to three inches broad, deltoid, bipinnatifid; *pinnæ* rigid, spreading, one to one and a half inches in length, one-quarter to three-eighths in breadth, with numerous distantly-placed sessile pinnæ on each side, which are cut to the base into three linear mucronate *segments*, of which the central one is the largest, but is not more than one and a half to two inches long; rachis polished like the stipe; texture coriaceous; both surfaces naked, very pale glaucous green; involucre broad, coriaceous, crenate, rolled permanently over the sori (Hooker & Baker's *Synopsis Filicum*).

HOSE who are familiar with the Latin classics may remember the pretty story told in the fifth book of Ovid's "Metamorphoses," wherein the daughters of Pierus, a wealthy Macedonian, proud of their position and of their accomplishments, challenged the Muses to a vocal contest, and for their presumption were turned into the chattering bird known as the magpie. Urania, in telling the story to Minerva, says the unfortunate girls were born in Pellæa, which is probably another name for ancient Macedonia. So many of the botanists of past times were so fond of selecting classical names for the genera they founded, that one might be pardoned for supposing that the learned German Professor Link who in 1841 first established the genus *Pellæa* may have had this in his mind, especially as the explanation of John Smith, in his "Historia Filicum," that the name is from a Greek word having reference to "the dusky color of the fronds," seems hardly clear, for there is no more of "dusky" color in the fronds of *Pellæa* than in many other ferns. But it so happens that in this case Link tells us what botanists do not always tell, his reason for the name "stipes

rigidus, badius," "from whence I have given it the name of *Pellæa —badius* being the Latin adjective denoting a chestnut-bay or sorrel color;" and, as we see, from the stipes or stalks, and not "from the fronds." The color of the stalks of a fern would not, of course, do to build a genus on, but the polished brown stipes, as we see in our plate of *Pellæa ornithopus*, is so common to many of the genus that it was a good thought to take this character for the little important meaning of a family name. Previous to Link's time the species of this genus were classed with *Pteris*, a well-known family of Ferns, and from which, indeed, they differ so little in the characters usually adopted for genera, that Professor Wood, in one of the editions of his "Class-Book of Botany," might seem justified in remarking that "their separation to a new genus is an over-refinement." It is, however, a case where the general appearance suggests a difference which science has not been able clearly to define. For instance, Chapman, in the "Flora of the Southern United States," describes *Pteris* as a genus having "sporangia borne on a transverse marginal receptacle connecting the ends of the veins," while *Pellæa* is described as having "fruit dots oblong or linear at the ends of the veins, confluent in a broad marginal line of fructification;" but the student will understand that he has a *Pellæa* much more readily from the general appearance of the plant than by the nice distinctions this nearly synonymous language conveys. Mr. John Smith well remarks that the "normal punctiform sori (that is, the fruit dots) of some species of *Pellæa* are so united as scarcely to differ in technical character from *Pteris*." Then there are other genera, such as *Allosorus* and *Cheilanthes*, from which it is often difficult to distinguish some species of *Pellæa*.

Plants of the genus *Pteris* are known as "Brake" or "Bracken," and under this name especially the *Pteris aquilina* is known in English poetry, as well as in popular English literature generally. The use of this word in connection with this class of ferns comes from very ancient times, and is believed to be derived from an ancient Saxon word similar to it, and having the same mean-

ing as we attach to a "clearing," or land ready or capable of being broken up with the plough, as distinguished from woodland; and then from the "Brake Fern," generally growing in these open places rather than in woods, as most other ferns of the old world known to the ancients did. *Pellæa*, taken from *Pteris*, grows rather on rocky places, and it is probable from this, in connection with the ancient popular name, that it has received the popular name of "Rock-Brake." "Bird's-foot" is the translation of its specific name, *ornithopus*. The lower pinnules are ternately divided, and have much the appearance of a track made by a bird's foot, from whence the name is derived. The student must not, however, consider this division of the pinnæ a very important character, as it is not unusual to see specimens in which most of the pinnæ are undivided, and when better opportunities for investigation are afforded, many of the western species now thought to be distinct will probably be found united under fewer names.

This species is a very pretty one. It is a native of California, from whence it often comes in collections of dried specimens, showing that it is not uncommon in that region. As already noted of *Pellæa* in general, it does not make its home in low alluvial soils where rains and floods would soon tear its delicate fronds away; but it loves, in the language of the poet Percival, to exhibit

> "——its rare and beautiful forms,
> In sporting amid those towers of stone,
> And is safe, when the wrathful spirit of storms
> Has made the top of the wave his own."

Dr. C. C. Parry, however, informed the writer of this that in his collections in California he often found it on gravelly knolls, where it could be protected from washing away by the aid of such plants as *Adenostoma*, *Ceanothus*, or *Pæonia Brownii*, when the fronds would be very luxuriant though then assuming a rather stiff habit, and having a real lurid hue, warranting Mr. John Smith's interpretation of the generic name.

It varies very much in size: sometimes plants fruiting perfectly are but a few inches high. We have some fronds before us, sent by Dr. L. D. Morse from San Mateo, which are nearly a foot in length. This specimen has very few ternate pinnules. Our illustration is a good average size, and was taken from a plant growing in the Arnold Arboretum, under Mr. Jackson Dawson's care.

It is now not uncommon under culture, and proves itself well adapted to window gardening, not being so particular about a moist atmosphere as many cultivated ferns are.

EXPLANATION OF THE PLATE.—1. An average-sized plant with pinnules nearly all entire, only a few being ternate. 2. An enlarged pair of pinnules, showing the broad indusium extending all along the margin of the frond.

LOBELIA CARDINALIS.

L. PRANG & COMPANY, BOSTON.

LOBELIA CARDINALIS.

CARDINAL'S FLOWER.

NATURAL ORDER, LOBELIACEÆ.

LOBELIA CARDINALIS, Linnæus.—Stem tall, two to four feet high, simple, smoothish; leaves oblong-lanceolate, slightly toothed; raceme elongated, rather one-sided; the pedicels much shorter than the leaf-like bracts. (Gray's *Botany of the Northern United States.* See also Chapman's *Flora of the Southern United States,* and Wood's *Class-Book of Botany.*)

MATHIAS DE L'OBEL, in whose honor *Lobelia* was named, was born at Lisle, in Flanders, in 1538, and died in London in 1616, having reached the good old age of seventy-eight. From the various accounts that have come down to us we gather that he was a remarkable man. He appears to have been taken to England before his twelfth year. In comparatively early life, and during the reign of Queen Elizabeth, he was gardener to the Earl of Zouch, at Hackney, near London. While in this situation he distinguished himself as a botanist, and subsequently was appointed botanist and physician to King James the First. His works are voluminous, and profusely illustrated by wood-cuts. These illustrations can scarcely be recognized now as belonging to the plants for which they were intended, and in this light it is amusing to find Lobel quoted by Gilibert, as complaining that the cuts illustrating the work of his predecessor, Mathiolus, are so unlike Nature, that he thinks this early author must have drawn his pictures in many cases from his imagination! It is pleasant to feel that the art of delineation has now progressed to such perfection, that no one in the next two or three hundred years will charge the authors of "Flowers and Ferns of the United States" with a similar weakness. It was not till nearly one hundred years after his death that *Lobelia*

was named in his honor by Plumier, and this fact shows in what estimation his works were held by those who so long afterwards followed him. In many cases plants, with comparatively modern names, were already known under other names long before, and those now named *Lobelia* were called *Rapunculum* in old works; but our present species, *Lobelia cardinalis*, was probably not known to Lobel himself, as the first notice of it that we find in English history occurs in the "Herbal" of Parkinson, thirteen years after his death, who says he had the roots from France where it was received from the New World, having been sent over by the French who had settled in Canada. It is therefore probable that the Cardinal Flower was among the earliest of our native flowers to receive attention in England. It is also probable that the popular name of Cardinal's Flower came with the plant from France, for it is referred to by Rivinius, Ruppius, and other early continental authors, as being then the popular name; but the earliest reference to this name is by Parkinson as before cited. The name was no doubt suggested by the very showy scarlet flower, as a cardinal is one of the highest dignitaries of the Roman Catholic Church, and is distinguished by his wearing a bright scarlet cassock and scarlet hat. That it has many elements of superiority over other plants will be readily admitted, and this fact seems to have impressed itself on many differently-constituted minds. Thus while the early French Canadians would invest the flower with a religious association, others compare it with royalty, and we find Mrs. Sigourney referring to it as

"Lobelia attired like a queen in her pride."

Some have martial superiority in view, and our ancient friend Parkinson assures us that it is a "very brave" plant. In all these allusions, however, we see the idea of superiority prevails, and it is not surprising that the floral emblemists have dedicated the Cardinal Flower to "Distinction."

As to its exact place among beautiful flowers, there may be a question. Dr. Lewis Beck, who, in 1833, published a "Botany

of the Northern and Middle States," regarded it as "one of the most beautiful plants in the Northern States;" and this, perhaps, would be the verdict of many admirers. It is undoubtedly a gay flower. A person may be gay, or even a cardinal, a queen, or the bravest of the brave, and yet not be beautiful. It will be an interesting theme for a student in beauty. Richness of color and strength will be found, but few other elements of the beautiful.

The Cardinal Flower has some interest from its association with a class of plants famous for medicinal if not for noxious qualities. Dr. Erasmus Darwin, in his "Loves of the Plants," now approaching one hundred years old, sings:

> "And fell Lobelia's suffocating breath
> Loads the dank pinion of the gale with death."

He is referring to a story about a West Indian species, to the effect that it produces pains in the breast, and a difficulty of breathing in a person who may be some feet away from it. Our species is, however, rather beneficial than noxious. Dr. Peyre Porcher, in his "Resources of the Southern Fields and Forests," says that it "is used by the Indians as an anthelmintic," and Rafinesque, in his "Medical Botany," refers particularly to the Cherokees as using it—a tribe which at that time inhabited portions of Georgia and Tennessee.

The Cardinal Flower has a wide distribution over our continent. Dr. Gray limits it to the east of the Mississippi in the Southern United States, and from New Brunswick to the Saskatchewan in the north. Forms found in Colorado, Arizona, and Texas, he regards as constituting another species. But those who have had the plant under cultivation, and noted how much it varies, may be pardoned for believing that *Lobelia cardinalis*, *L. splendens*, *L. fulgens*, and perhaps other named species from Mexico, are but variations of the same thing. The acknowledged species is found to vary in color even in a wild state. White, yellowish, rose, and crimson, as well as the usual

scarlet-colored flowers, are sometimes found. In the South, according to Dr. Chapman, it is generally found in the muddy banks of streams. In most parts of Pennsylvania we seek some deep glen, where

> "——the spring that gushed,
> In overflowing richness from the breast
> Of all-maternal Nature,——"

may have left a swampy deposit in some tiny little plain, in order to find it in perfection. Our drawing was made from a plant sent by Mr. John T. Lovett, from Monmouth county, New Jersey, taken, as he describes it, "from an open swamp." In cultivation it is found to do well in common garden ground, if not very hot and dry.

EXPLANATIONS OF THE PLATE.—1. Central portion of a stem that was three feet high. 2. Upper portion of the same in flower. 3. Showing the stamens united in a band round the pistil; after they have ceased to grow the pistil continues to develop, and finally expands its bilobed stigma, *a*.

CYPRIPEDIUM ARIETINUM.

L. PRANG & COMPANY, BOSTON.

CYPRIPEDIUM ARIETINUM.

RAM'S-HEAD MOCCASIN-FLOWER.

NATURAL ORDER, ORCHIDACEÆ.

CYPRIPEDIUM ARIETINUM, Aiton.—Stem leafy; leaves elliptical, striate-veined. Sepals three, distinct (the two lower not united), linear-lanceolate, the upper oblong-ovate, acuminate; two lateral petals linear; lip as long as the petal, saccate, obconic. Stems usually clustered, flexuous, eight to twelve inches high, lower part sheathed. Leaves three to five, two to three inches long by one-half to one inch wide, sessile, amplexicaul. Flower mostly solitary, with a leafy bract at the base. Segments about equal in length, the upper one as broad as the other four together. (*Wood's Class-Book of Botany.* See also *Gray's Manual of the Botany of the Northern United States.*)

HOUGH a person may have but a slight acquaintance with flowers, the one we illustrate will be readily recognized as belonging to the great Orchis family, or, as a botanist would say, to *Orchidaceæ*. There is something so odd in the appearance of an orchid flower, and the oddity is so peculiar, that after one has learned to distinguish a few, there is little difficulty in recognizing one of the family whenever it is met with. This natural resemblance is in a great measure the foundation of what is now known as the natural system of botany. In comparatively recent times the number or arrangement of the stamens or of other parts of the flower, decided the class or order to which a plant in question belonged; and this seemed so simple and so easy a way of getting knowledge, that many regretted when the natural system was introduced, and the old artificial systems were set aside. How very artificial some of these systems were, may be understood when the reader learns that under the sexual system of Linnæus, our plant would be in the class Gynandria, and that in the same class might be found the Passion flower, and the "Dutchman's Pipe" or *Aristolochia!* Linnæus himself saw the incon-

gruous results of these artificial systems. He saw that jumps from a Passion flower to a *Cypripedium* and similar leaps were so unnatural that in 1751 he wrote, "The natural system is the first and last desideratum in botany. 'Natura non facit saltus,'" that is, Nature does not leap. In pursuance of this idea he mapped out many natural groups, and of these "Orchideæ" was one; the name being taken from *orchis*, which not only represented a very large collection of species at that time, but was perhaps the most ancient of any of the family names. For Orchis is one of those flowers which has a place in heathen mythology. Therein we are told that Orchis was the son of a rural god named Patellanus and the nymph Acolasia. He was one of the most dissolute of the heathen gods, and excited the resentment of one of the priestesses of Bacchus, who stirred up some of the male attendants at the festival of Bacchus to redress the insults offered to her, whereupon they fell upon him, and tore him to pieces. The general verdict of his co-deities was that it "served him right," and he would perhaps have been suffered to lie in oblivion had not his father Patellanus had some influence with the superior gods. And so at the paternal request his dead body was turned into the flower which as "Orchis" still bears his name.

The genus *Cypripedium*, to which our present subject belongs, was not however known to the ancients. The name was given to it by Linnæus, and is derived from two Greek words, *kypris*, one of the names of Venus, and *podion*, a slipper. Before this time the European species, *Cypripedium Calceolus*, was known as *Calceolus Mariana*, or the Shoe of Our Lady the Virgin Mary; and though the name of Linnæus was new, we see that it may have been suggested by the popular one.

The subject of our present chapter, *Cypripedium arietinum*, is by no means the gayest of these slippers of Venus. Some have already appeared in our work which the reader will regard as of a handsomer pattern. But this one is in some respects more interesting, and especially because it is the connecting link between *Cypripedium* and other genera of the great Orchid family. The

type of the orchid flower is to have its parts in three-leaved verticils, that is to say, if all the parts were to appear in the gradual rhythmical order we find in so many flowers, we might expect to see a three-leaved calyx, a corolla of three petals, three or six stamens, and perhaps three pistils; but in Orchidæ so many of the parts have been remarkably developed, suppressed, or united with other parts, that the student often has to use some ingenuity to discover the original plan. In many orchids, however, the outer whorl of three, forming the calyx of other flowers, can be readily traced; but it is one of the peculiarities of *Cypripedium* to have apparently but two, because two of the original parts have been united into one. In the species we now illustrate the relation with other genera is somewhat preserved by all the three being separate and distinct. As this union of the sepals into two portions was formerly considered one of the chief foundations of the genus *Cypripedium*, some botanists, notably Beck in his "Flora of the Northern and Middle States," one of the earliest systematic works on American botany, made this into a distinct genus on account of its three-leaved calyx, under the name of *Arietinum Americanum*. The flower differs in general appearance from other American *Cypripediums*, and suggested to R. Brown, who first described it in Aiton's "Hortus Kewensis," the name *arietinum*, from the resemblance of the flower, when held in certain positions, to the head of a ram.

This species was not known to the earlier botanists. The earliest note we find of it indicates that it was first discovered near Montreal, Canada, in 1808. But Muhlenberg, who, in 1813, published a catalogue of North American plants, does not include it in his list. Nuttall refers to it in 1818, but still confines it to Canada. Of late years it has been reported from Maine to New York, and is in Parry's lists of Minnesota plants. Prof. Aughey reports it from Nebraska, which is probably its western limit. In all these locations it is believed to be rare, and those who collect it usually regard themselves as fortunate. The writer has never been one of these lucky botanists, and he is indebted for the spe-

cimen used in our illustration to the kindness of Professor Sargent, of the Cambridge Botanic Garden, Massachusetts. According to Professor Asa Gray, it has to be looked for in cold swamps and damp woods, flowering about June. It is regarded as the smallest flowered species of all American *Cypripediums.*

DESMANTHUS BRACHYLOBUS.

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DESMANTHUS BRACHYLOBUS.

ILLINOIS ACACIA.

NATURAL ORDER, LEGUMINOSÆ.

DESMANTHUS BRACHYLOBUS, Bentham.—Nearly glabrous perennial, erect, one to four feet high; partial petioles six to fifteen pairs; leaflets twenty to thirty pairs; stamens five; pods oblong or lanceolate, curved, scarcely one inch long, two to six-seeded. (Gray's *Manual of the Botany of the Northern United States.* See also Wood's *Class-Book of Botany.*)

THERE was a time when plants which had not gaudy colored flowers were thought unworthy of popular admiration. But in these days we find beauty in lines, and in the relations of parts to the whole; beauty in expression, as well as beauty in general habit and appearance. Ferns, Palms, and other plants with no colors but brown or green, are now sought for with as much zest as the Rose or the Tulip; and indeed what are called "foliage plants," or those which have nothing to recommend them but what may be found in the leaves, are in high favor with persons of the most cultivated tastes. The plant which we now illustrate has nothing that would popularly be called flowers; for there seems to be only five long slender silk-like greenish-white stamens projecting from a small green base, and these united into a little bunch of about six or eight together, forming an insignificant tassel-like mass; but it is one which will have an interest for all who love pretty foliage. A good stocky plant growing in one's garden, and in contrast with more pretentious flowers, is sure to attract general attention. The plant from which the drawing was taken grew in the garden of the writer, from seeds gathered by him in Texas in 1873, and is always admired by those who see it. It will not, however, allow itself to be roughly used, and a branch soon withers or

even drops its leaflets, when cut. In the specimen taken by our artist some of them had fallen before he had finished his task, as may be seen in his faithful reproduction. It is more interesting when in fruit than in flower, as the curved mass of greenish-brown immature pods make a pretty contrast with the lighter lines of its numerous small leaflets. If the main stems only had a little more lightness, and were somewhat curving as they often are in ferns, there would be few plants able to cope with it in this particular style of beauty.

Both the genus and the species have an interesting botanical history. Some of the species have been long known, but they were classed with Acacias and Mimosas; plants with which most intelligent readers are more or less familiar. Michaux knew them as *Mimosa*, and in his Flora of North America, published in 1803, our present species is described as *Mimosa Illinoensis*. Willdenow was the first to detect the essential difference from Mimosa, and in 1805 established the genus *Desmanthus* as it now stands. The chief difference is in the seed-pods. In *Desmanthus* they are flat, membraneous, with several seeds (Fig. 3), and split open at the edges as a pea or a bean would do; while *Mimosa* does not split open, but breaks off transversely into as many pieces as there are seeds in the pod. Succeeding botanists attempted to divide the genus still further, and Decandolle made a new genus of our present species, naming it *Darlingtonia* in honor of Dr. Darlington, of Pennsylvania, one of the most intelligent and esteemed botanists of the past age. The chief difference relied on to distinguish *Darlingtonia* from *Desmanthus* was in the sexual character of the flowers. In *Desmanthus* the flowers are not all with stamens or pistil in the same flower, but as botanists would say the flowers were polygamous; while in the proposed *Darlingtonia* they are always perfect, that is to say with all the parts necessary to completeness in each flower. But in these days characters of this kind have little value in determining genera, and the more modern name of *Darlingtonia* has been abandoned for the plant's earlier name of *Desmanthus*. It is interesting to note that when Dr.

Darlington's friend, Dr. Baldwin, was appointed naturalist to the exploring expedition of Major Long, Dr. Darlington wrote to him jocosely, that he might perhaps find on his travels the "Darlingtonia ignota." Dr. Baldwin died at Franklin, Missouri, before the expedition had fairly started; his successor, Dr. James, "did find a species of the genus, afterwards named Darlingtonia," as Dr. Darlington himself remarks in his "Reliquæ Baldwinianæ," but only as we have seen already to be a veritable "ignota" in the end. However the good Doctor had the pleasure to know before he died, that a good substantial genus of Californian pitcher-plants was named in his honor by Dr. Torrey, and which will keep his memory much more fresh among lovers of plants than ever our *Desmanthus* would have done.

Desmanthus brachylobus does not appear to have any common name in our country. Aiton says at the time of its introduction into England it was known as the "Illinois Acacia," the name no doubt suggested by the botanical name of Michaux. It seems best to adopt this name now though it is not a true Acacia, because it is best to put up with a name of imperfect application, rather than to multiply synonyms. After all there is much more appropriateness in this common name than in the common names of many plants, for it is the most northern species of any near representative of the Acacia tribe. It extends up the drier regions of our country to the line of the Mississippi and Missouri, from Texas to Kansas and Iowa, where it forms a very interesting part of the prairie adornment of those States. It does not seem to extend far in from the Mississippi on the line of a moister climate towards the Atlantic Ocean, for Dr. Chapman does not include it in his "Flora of the Southern United States." It may be noted that while our species seems to avoid moisture, one species in the Eastern Hemisphere floats on water, and has been named *Desmanthus natans* in consequence, and which, indeed, one botanist endeavored to place in a new genus named from its floating habit, *Neptunea*.

Almost all our commentators say *Desmanthus* was derived

from *desma*, a bundle or bunch, and *anthos*, flower—Greek words —"because the flowers grow in bunches." But as the flowers grow no more in bunches than numerous others, it is not easy to understand how this should suggest a particular name. When Willdenow had the new genus in contemplation, he had before him for *Desmanthus*, *Mimosa virgata*,—the last name from the Latin *virga*, a tough, slender twig, and this renders Dr. Gray's explanation from "desma a bond," more plausible.

EXPLANATION OF THE PLATE.—1. The upper portion of a flower stalk. 2. Cluster of immature seed-vessels. 3. A single pod.

BOTRYCHIUM TERNATUM.

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BOTRYCHIUM TERNATUM.

TERNATE GRAPE-FERN.

NATURAL ORDER, FILICES.

BOTRYCHIUM TERNATUM, Swartz.—Plant fleshy, sparsely hairy or nearly smooth, usually from twelve to fourteen inches high; sterile segment long-petioled from the base of the plant, broadly deltoid, ternate, variously decompound; primary, secondary, and even tertiary divisions stalked; ultimate divisions from roundish-reniform to obliquely ovate or ovate-lanceolate, crenulate, or toothed or incised; fertile segments twice to four times pinnate, usually much taller than the sterile; bud pilose. (Eaton's *Ferns of North America*. See also Williamson's *Ferns of Kentucky*, and, under the name of *Botrychium lunarioides*, Gray's *Manual of the Botany of the Northern United States*, Chapman's *Flora of the Southern United States*, and Wood's *Class-Book of Botany*.)

WHEREVER practicable it is preferable to select the botanical descriptions from text-books in general use, and easily accessible to the student. In this case the description is taken from the rarer but very valuable work of Professor Eaton, because to him chiefly belongs the credit of determining the proper name which, according to botanical rules, this fern is entitled to; and of showing the true relationship which many forms bear to it that have been described and named as distinct species by botanists who preceded him. The extent to which species varied was not known to botanists of the past generations as it is known to us, and even the distinguished botanist who gave our plant the name of *Botrychium ternatum* also gave to another form the name of *Botrychium lunarioides*—the name used by Dr. Gray and others as quoted, but which is now regarded as only a form of the same thing. So variable is this fern, and so little was known of the range of this variation, that no less than fourteen names are recorded by Eaton as having been given to forms as species, which he now regards simply as varieties, and the names therefore ranking as little more than synonyms. Two

of these forms are placed on our plate, because they are both thought by Dr. Gray in the "Manual" to be distinct enough to retain Latin names as varieties. Fig. 1 is his *Botrychium lunarioides, var. obliquum;* Fig. 2 is his *B. lunarioides, var. dissectum.* It will be seen by even a mere glance at our plate, that in the main features they are both the same. The finer division of the frondose portions is all that strikes the eye; but in most ferns it is so common to notice variations in the subdividing of the frond, that in this case the character is hardly worth even a distinctive varietal name. One of the best characters to distinguish species of *Botrychium* is in the degree of union between the barren and fertile fronds. In some species the stipe of the barren is wholly united to the fertile, so that the frond seems sessile on the common stem. In our present species we see in both forms on our plate, that the union is only for an inch or so, before the barren frond diverges and retains the remaining portion of the stipe for its own account. Professor Eaton calls attention to a peculiarity which distinguishes this species from all others. It is that the young bud before it pushes from the ground for the season's growth is pilose or hairy. Not as a specific character—that is, one confined to a single species; but as one common to several other species, he notes that this bud "is completely enclosed in the hollowed base of the stalk, and in it may be distinctly seen the rudiments of the fronds for the next two or three following years." The stem so completely envelops this bud in some species, that it is likely to be overlooked early in the season without a careful examination—but it is worth looking for and studying, as it affords a clew to the union of the stipes as already noted. This particular formation of a miniature plant, so far before development, was partially noted by Linnæus, who, in speaking of the European plant then named by him *Osmunda Lunaria*, says, "within the base of the stem, early in spring, may be found a complete rudiment of next year's plant." It shows how closely the great botanist, now nearly one hundred and fifty years ago, examined the plants that came before him, though he

did not observe so closely as to see the essential difference between this genus and *Osmunda*, which is now well understood. One difference consists in the spore cases having no jointed band surrounding them, as in *Osmunda* and other ferns, but are in little grape-like vesicles, which burst laterally and divide into two equal halves when mature. (Fig. 4.) This peculiarity is so marked, that some botanists, notably Dr. Lindley, proposed to consider this and *Ophioglossum* as forming a distinct order as *Ophioglossiaceæ;* and the others, or what would then be called the true ferns, *Polypodiaceæ*. It is from the grape-like capsules that the genus takes its name *Botrychium*, *botrys* being Greek for a bunch of dried grapes.

In regard to the common name, it seems best to follow Eaton in the use of "grape-fern" for the genus, though most American botanists who preceded him call all the species moon-worts. This last was the common name of a single species, known to the botanists of several hundred years ago as the *Lunaria*, and which they so called from the pinnules resembling a half-moon. This is what is now known as *Botrychium Lunaria*. There is no reason why this name should follow to other species, especially as in literature it is likely to be confused with another "Moon-wort," which has become popular in English history as a plant used in conjurations and other mysterious rites, and to which the well-known English poet, Drayton, refers in the lines—

> "Then sprinkled she the juice of rue
> With nine drops of the midnight dew,
> From Lunary distilling."

This famous Moon-wort is a cruciferous plant, *Lunaria biennis*, and is still grown in gardens for its singular moon-like seed-vessels.

Our Ternate Grape-fern has evergreen fronds, which in the fall of the year turn from a rich green to a pretty bronzy purple, and then add their portion to the numerous beautiful colored tints which make American autumn scenery so famous all over

the world. Our artist has taken his drawing at this particular season, and the pretty tints the lithographer has faithfully reproduced. In some one of the numerous forms which it loves to assume, the species is found over the greater part of the world, and is as common in Japan as here; but whether it carries this change of coloring with it in its migration is not recorded. This very change of form is credited to "climatic peculiarities" by Mr. John Smith in his "Historia Filicum," but though the various forms are found more or less localized in the different parts of the world wherever the species is found, the rigid demands of modern science for explanation of terms and an accurate application of their meaning, will render "climatic peculiarities" as little more than a suggestion.

EXPLANATION OF THE PLATE.—1, 2. Stalks of two varieties. 3. Upper and fertile portion of the stem. 4. Magnified capsules, showing transverse openings.

BRODIÆA COCCINEA.

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BRODIÆA COCCINEA.

SCARLET CALIFORNIA-HYACINTH.—FIRE-CRACKER FLOWER.

NATURAL ORDER, LILIACEÆ.

BRODIÆA COCCINEA, Gray.—Scape erect; perianth broadly tubular, six-saccate at the base, the tube four times longer than the segments; anthers not winged. Leaves two to three lines broad, one foot long or more; scape two to three feet high; valves of the spathe four to six, lanceolate or linear, deep-red, six to twelve lines long; umbel four to twelve-flowered, pedicels eight to twelve lines long; perianth twelve to sixteen lines long, the tube deep scarlet, three to four lines broad, the lanceolate-oblong segments yellowish, two and a half to three lines long, spreading; anthers linear, equalling the segments, emarginate at the base; staminodia yellowish, very broad, square, toothed, half shorter than the anthers; ovary oblong, stipitate, the cell four to six-ovuled; style eight to nine lines long, filiform. (Watson's *Botany of Clarence King's Expedition.*)

THE first species of *Brodiæa* discovered, *Brodiæa grandiflora*, had so much in its general aspect suggestive of the familiar plant of our dwelling-rooms and green-houses, that "California Hyacinth" seemed a not inappropriate common name. Though not a true Hyacinth, it comes as near to this famous flower of the poets as does perhaps any one of our wild plants. Miss Louisa Twamley makes one of her characters inquire why so much consideration should be given to these floral fables of the ancients. Æmilia says:

> "Then, Leon, tell me why
> These strange old heathen poets can so win
> Your admiration, since you know all false,
> Wild, and irrational, which they have taught
> About these innocent things?"

To which Leon makes answer:

> "All this I own,
> And yet, Æmilia, I have truth to urge;
> Even the fable linked with this sweet flower

> Is truth scarce veiled by fiction:—HYACINTH,
> Beloved by Zephyr and Apollo both,
> Preferred the Sun-god to the Western wind,
> Who, thereat angry, wafted him his death.
> Is not the sun more welcome than the breeze
> To all these fragile blossoms? Doth not oft
> A sudden gale rend stems and murder flowers?
> You see the fable's not so far from truth,
> My lovely sceptic."

It is indeed the mission of real poetry to place homely truths before us in pleasant guise, and to this end few things offer themselves more acceptably than flowers to the true poetic spirit; and when our native flowers shall have received the attention they deserve, our "California Hyacinths" may have as much to tell us of our lands as the ancient Hyacinths have sang to us of theirs.

This pretty species has a little history, which Professor Alphonso Wood, with commendable feeling, endeavored to idealize. The plant was unknown to any botanist till 1867, when Professor Wood, riding across the high hills of the Trinity mountains in California, had it pointed out to him by the stage-driver, who, in admiration of its simple beauty, as he told Professor Wood, had named it "after his little daughter, Ida-May." A botanist is not called on by the needs of science to regard the affections or desires of the common people who may not be botanists; but it is to their credit to regard them when they feel that they may. It shows that even dry science can enter into the heart of humanity. Dr. Wood at that time believed the plant to be a new genus. He named it *Brevoortia*, in honor of J. Carson Brevoort, of Brooklyn, a regent of the University of the State of New York; and for its specific name *Brevoortia Ida-maia*, as well to commemorate the parental affection of the driver for his daughter, as that he "saw it first on the ides (15th) of May." In striking contrast with this pleasant effort of Professor Wood are the supposed needs of science. In the "Memoirs of the American Academy of Arts and Sciences" for 1867, Professor Asa Gray gives reasons for setting aside the name of *Brevoortia*, and placing the species in the older genus, *Brodiæa*, and remarks:

"In referring it to *Brodiæa*, we may venture to discard the objectionable double-headed name given by the stage-driver, Mr. Burk (who showed the plant to Professor Wood), 'in affection for his little daughter.'" Thus it was renamed *Brodiæa coccinea*. Double-headed names, objectionable as they may be, are not uncommon in botany; and of this the genus *Asa-græa*, established by Lindley in commemoration of Dr. Gray, is an illustrious example.

As a matter of interest to the botanical student, it may be here noted that it is often difficult to fix distinguishing characters for many genera of Liliaceous plants. The theoretical type is that the verticils are on the plan of three. The perianth or flower cup is composed of what in most flowers would be a calyx of three leaves, and a three-petaled corolla. In *Brodiæa* the two verticils are under but one influence, and they are so nearly alike that they seem as if of one verticil of six portions. But the staminate verticils have been separately influenced, and the lower set of three have taken on more the form of additional petals than of ordinary stamens. Indeed, there are but three perfect stamens; the other three are represented by the little crown around them. It is on the greater or less degree of development of this outer whorl—the third in the floral series—that botanists distinguish genera in some cases. If this set of three appeared like stamens, only lacking the anthers, it would be *Leucocoryne;* with the apex a little flattened out, a *Brodiæa* proper; with true petal-like processes, a *Dichelostemma;* with these petaloid processes cleft, making a six-lobed crown, a *Stropholirion;* or reduced to broad scales, with no semblance of a stamen remaining, a *Brevoortia*. But whatever value these particulars may have in systematic botany, these points show an interesting progress in the development of one form to another that few plants will show so well.

As for the great beauty of the plant in its native locations, no better picture could be painted than that by Mr. James Vick, who made a close acquaintance with it in its mountain home. He says: "It is one of the most curious and interesting of Cali-

fornian wild flowers, and is called 'Fire-cracker Flower,' but its botanical name is *Brodiæa coccinea*. The flowers are a little larger than Chinese fire-crackers, nearly the same shape and color, though the scarlet is more brilliant. The clusters are very large, and if my recollection is not at fault, they measured sometimes eight inches across, and at a little distance the resemblance to a pendant bunch of fire-crackers is certainly very striking. The bulb grows deep in the ground, as do nearly all the Californian bulbs. The flowers retain their bright color for a long time after every particle of moisture has dried out, and I have had them of good color six months after being gathered. From forty to fifty flowers are often found in a single stalk. The root is edible, and sought for by the Indians, and abounds in a mucilaginous or starchy substance, very apparent when a bulb is only slightly bruised. It belongs to the Lily family, and is found mainly along the Northern coast of California, on the tops of the mountains, in gravelly and rocky soils, in open woods, among oaks and conifers."

Professor Asa Gray has characterized it as "a very striking and handsome plant," and every botanist has spoken of it as beautiful each in his own way; but no one has described it as so large and so floriferous as Mr. Vick, who evidently met with it in an unusually favorable spot, and what he has said of it is encouraging to those who may be disposed to cultivate it. Our specimen was taken from an under-sized plant because it gave the opportunity to show on our small page every part of it from the bulb and fibrous roots to the opening flowers; and we are the more glad to have been able to do this as very often the bulb shows better distinguishing characters than any other part of the plant. The drawing has been taken as the flowers are opening, instead of after they have formed the "pendant umbel" spoken of by authors, as in this stage it gives the opportunity of showing how the buds behave before expansion.

EXPLANATIONS OF THE PLATE.—1. Complete plant. 2. Flower opened to show the internal arrangement. 3. Stamen, with oval pollen grain. 4. Ground-plan or front view of the flower.

LACHNANTHES TINCTORIA.

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LACHNANTHES TINCTORIA.

WOOL-FLOWER.

NATURAL ORDER, HÆMODORACEÆ.

LACHNANTHES TINCTORIA, Elliott.—Root red, fibrous; stem mostly simple, villous above; leaves linear-sword-shaped, smooth, the lower ones crowded and equitant, the other smaller and remote; flowers two-ranked, crowded in lateral and terminal compound woolly cymes, yellowish within; exterior lobes of the perianth linear; valves of the capsule separating from the placentæ; seeds black. (Chapman's *Flora of the Southern United States.* See also Gray's *Manual of the Botany of the Northern United States*, and Wood's *Class-Book of Botany.*)

ONE of the earliest of American botanical authors, Thomas Walter, who in 1788 wrote the "Flora Caroliniana," mentions the plant we now illustrate, and called it *Anonymus tinctoria*, which would be literally "a dyer's plant without a name." In the early part of the present century it came under the notice of Pursh, who believed it to be a *Dilatris*, a small genus hitherto found only at the Cape of Good Hope. Michaux, before him, had supposed it was identical with a genus named by Schreber in 1789 in honor of the distinguished botanist, L'Heritier, in which genus the celebrated "looking-glass plant" is found. It was not till 1821 that its true position as a distinct genus was determined by Stephen Elliott, who wrote the "Sketch of the Botany of South Carolina and Georgia," and who named it *Lachnanthes*—the name it still bears. This little piece of history shows how interesting the plant must be to the student, when so many excellent botanists failed to discover its true relationship; and it proves that Walter was not much to blame when in apparent despair he declared the genus to be "anonymous."

As the name *Heritiera* in connection with this plant, though no longer used, will often be met with by those studying the history of American Botany in the early part of this century, it may be remarked that L'Heritier was conspicuous for his opposition to the use of colored plates in botanical works. He thought they never could be made sufficiently correct to answer any good purpose, and we are tempted to reproduce his opinion here, as showing by our "Flowers and Ferns of the United States" how wonderful has been the progress of art, which not only makes colored plates sufficiently and wholly accurate, but makes it so by machinery! Only a very few copies of L'Heritier's drawings were colored; and these, as he tells us, only at the especial request of a few friends. L'Heritier was born in Paris in 1746, of wealthy parents, and early in life had the charge of the forests in the department of the Seine. He was one of those rare men who find something to study in everything that comes before them; and thus in the performance of his duty as a forester, he was attracted to the wild flowers, and from this rose to be an eminent botanist. He took an active part in bringing on the downfall of monarchial institutions, and which finally resulted in the French revolution. He died in August, 1800, having been murdered on his own grounds, it was believed by a worthless debauchee in the shape of his own son. One biography of him says, "a victim to science," though exactly how science thus stimulated his murder does not appear. Elliott's name *Lachnanthes* seems to be derived from two Greek words—*lachne*, wool, and *anthos*, flower, from the striking character of the flowers; and, as the plant has not received any distinctive popular name, we have proposed "Wool-flower" to supply the deficiency. It is often spoken of as the "Blood-wort," "Blood-root," and "Red-root;" but as these names are used indiscriminately for other and very different plants, it is hardly worth an effort to retain them especially for this. All these names, as also the specific name *tinctoria*, come from its reddish root, which seems to have been in some repute in the past as a dye. Redouté, a French writer

on lilies, to which this plant was once referred, says that the roots and seed vessels give by simple infusion a beautiful red dye, which is, however, less permanent than other dyes of the same character. It is probably in little use now. Dr. F. Peyre Porcher, in the "Resources of the Southern Fields and Forests," merely remarks: "It is distinguished, says Wilson, for yielding a beautiful dye; hence the name." He also notes that "the root is astringent and tonic."

If, however, the root is of little consequence now in the arts, all our readers will admit that it has served our artist well in aiding him to make a beautiful picture out of what otherwise would have been very poor material; and it is worthy of note that in all the other illustrations of this plant that we have seen the roots have been omitted, though not only would they have added to the beauty of the illustration, but also have suggested an explanation of the name. Still, as a mere matter of beauty, the arrangement of the leaves will please the critical admirer. A bunch of them grows in the flat fan-like form represented in our plate. These leaves are flat and shining. They have a very artificial look in comparison with the usual works of nature; and as each one clasps the flower stem just opposite to the other and with remarkable regularity, the artificial character of the whole mass, though in the popular sense of the word unnatural, is particularly pleasing.

But the main interest in the plant will come from the botanical student, and centre in the character of the inflorescence. The flower in its structure may be said to be intermediate between an *Iris* and an *Amaryllis*, or that it is one of the *Iris* family in a state of progress towards an *Amaryllis*. An *Amaryllis* has six stamens, while an *Iris* has but three; but plants of the order to which *Lachnanthes* belongs are arranged for six stamens, while retaining the flat disposition of the leaves so common to the *Iris* family. Though arranged for six stamens, very often there are but three, as in *Lachnanthes* we are now describing (Fig. 3), but we know they are arranged for six, and that three must be

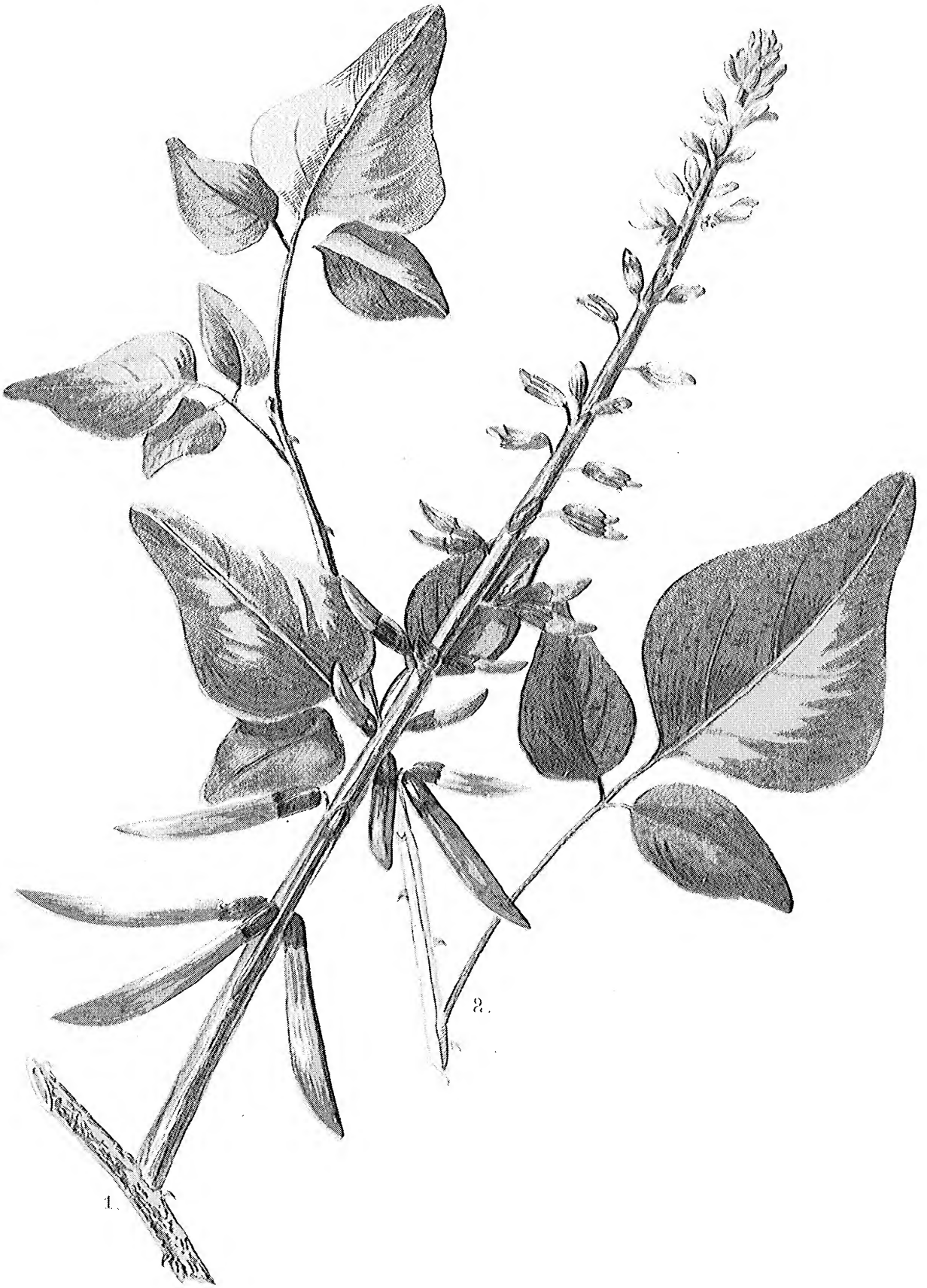
abortive, because the stamens are opposite the petals, showing thereby that they belong to the second whorl or verticil of three —the typical number in endogenous plants. If the first whorl had not proved abortive, they would have alternated with the petals, as the sepals do.

It is said by Endlicher that the primordial leaves which form the cells of the ovary, are also opposite the petals, and if so it would indicate that there has been a further abortion of a whorl above the perfect stamens. It is quite likely that in these cases the aborted parts will sometimes show indications of reappearance, and the watchfulness for these modifications will give great zest to those who are interested in that delightful department of Botany—now known as morphology.

The "Wool-flower" is not a very common plant. Our drawing was made from a specimen collected in Rhode Island by Mr. Jackson Dawson, and which is perhaps its most northern limit. Though it is a native of New Jersey, Dr. Willis, the author of a catalogue of the plants of that State, reports it as being very scarce. It becomes more common as we go southward to Florida, inhabiting ditches and ponds, but being confined chiefly to districts near the coasts. One of the most remarkable facts connected with its distribution is its existence in Kansas, according to Professor Snow's catalogue of Kansas plants. It does not appear to have been found in Iowa, Nebraska, Arkansas, or any of the neighboring States.

It does not seem to have been ever cultivated in our country, though Paxton tells us that it was introduced into England in 1812, and regarded as "a pretty plant" for that purpose. Judging from its natural conditions it would grow better as a pot plant, with the pot standing in a saucer of water, or treated as one would the common Calla, in order to do well.

EXPLANATIONS OF THE PLATE.—1. Portion of a root stock, bearing a flower stem, Fig. 2, of the natural size. Fig. 3. Flower somewhat enlarged, showing its woolly character, its three stamens, and simple awl-like pistil.



ERYTHRINA HERBACEA.

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ERYTHRINA HERBACEA.

DWARF CORAL PLANT.

NATURAL ORDER.—LEGUMINOSÆ.

ERYTHRINA HERBACEA, L.—Stems herbaceous, several from a very thick root, prickly, the flowering ones mostly leafless; leaves long-petioled; leaflets ovate or somewhat hastate; vexillum lanceolate, folded; seeds scarlet. Stems two to four feet high. Racemes one to two feet long. Flowers two inches long. Legume opening by one suture, opposite the seeds. (Chapman's *Flora of the Southern United States.* See also Wood's *Class-Book of Botany.*)

THE natural order of plants to which the *Erythrina* belongs has had various names given to it. The one in common use is *Leguminosæ*, derived from legume, which is the kind of seed-vessel the plants of this order generally bear. Dr. Gray defines a legume to be "a seed-vessel of a solitary carpel which normally dehisces only by the ventral suture," that is to say, having a seed-pod which splits open by its front side, when it splits open at all. But there are carpels in other plants besides those of the *Leguminosæ*, which split open in this way, and so this order has no exclusive right in nature to the name. Other botanists, Lindley particularly, take one genus as the type around which the order should close, and which should then give its name to the whole; and for this the botanist named selected *Faba*, and for the order *Fabaceæ*. As nearly all the orders are named in such a plan, there seems no valid objection in the case of the present one; but leading botanists have not adopted it. *Papilionaceæ* usually divides with *Leguminosæ* the favor of botanists. This is derived from *papilio*, the Latin name of the butterfly, and is suggested by the fact that the flowers in most cases take on somewhat the form of this insect. But how

uncertain these suggestions are as popular guides to a knowledge of the families of plants may be well seen from our present species, in which little trace of the butterfly can be found. It would be much more likely to lead us to imagine a sword fresh from the battle-field. Yet if we set aside popular appearances, and take up the flower in the light of a little botanical knowledge, we shall find that a very slight circumstance has led to this anomaly in this species. In plants of the papilionaceous order, the upper portion of the corolla, called the vexillum or standard, usually curves outwards or backwards, and enables us to see other portions of the structure; but in this case it remains bent downwards, and envelopes the rest of the flower, and indeed this vexillum is all we see in the illustration on our plate. This closed habit is somewhat characteristic of our species, for the well-known coral plant of gardens, *Erythrina crista-galli*, a Brazilian species, has an open and more nearly butterfly-shaped corolla.

The objects of these peculiar behaviors of flowers have become subjects of very interesting studies since attention has been directed to them by the observations of Mr. Charles Darwin, who regards the various forms of flowers as having relation to questions of pollenization. He mentions *Erythrina* in one of his works as a case where the flower cannot make use of its own pollen without external aid. One of his correspondents tells him that one in New South Wales produces seeds when the flowers are disturbed by hand as an insect would move them. Under culture we do not know of a case where either this species or the *Erythrina crista-galli* has produced seed, though in the last named plant the writer of this has applied pollen from other flowers on the same plant. As it evidently seeds freely in its native places, it may prove of interest to those who have the opportunity to investigate this matter thoroughly. The seeds are very beautiful, being of a bright, shining, coral color; and those of some species are used in Brazil as a substitute for coral in making necklaces. It may be from this fact that the

genus derives its name *Erythrina*, which is from the Greek *erythros*, meaning red, though the commentators usually tell us it is so called "from the color of the flowers." To some of the botanists, anterior to Linnæus, it was known as *Corallodendron*—literally the "coral tree." The earlier descriptions of the genus were not as perfect as they might have been. Linnæus made a two-lipped calyx an essential part of *Erythrina;* and Rafinesque, who edited the collections made by Robin, a French traveller in Louisiana, finding this one had a calyx regularly divided, made a new genus of it under the name of *Xypanthus*—or literally "sword-flower," a very good name if the genus had been allowed to stand.

But the meaning of the names of plants must not be depended on as a means of identifying a species. This species of *Erythrina* was called *herbacea*, because it seemed to die to the ground every year. But it does not always do so. Dr. J. G. Cooper, in a note "on the Forest trees of Florida," published in the "Smithsonian Report" for 1860, says the "*Erythrina herbacea* assumes almost a tree in Florida, growing twelve feet high, and is then scarcely distinguishable from *E. Corallodendron*, the coral tree of the West Indies, which grows twenty feet high. Its wood is very light, corky, and may be of use in the place of cork—but the wood of the latter named species is hard." Under cultivation a portion of the base of the stalks retains vitality through the winter, and it is from this last season's wood that the flowering branch proceeds in spring (Fig. 1). Lower down, and from the woody root stock, the new growth (Fig. 2) pushes, and from the base of which perchance a flowering shoot may issue the next spring. The root stock, almost wholly under ground, is thick and somewhat fleshy, and is spoken of by some authors as a "tuber," or "rhizome" by others; but it is little less than a real trunk, though a dwarf one, as in other trees or shrubs. But after all these terms represent mere modifications of the same one thing—a stem or trunk,—and while the names are useful as leading to precision of expression, they are apt to mislead if taken for distinct things.

Barton, in his "Flora of North America," figures a specimen which had been grown in Bartram's garden, and which he says was near four feet in length. This is unusual. Double the length of the one we have given in the plate is about the full size in wild specimens. We have selected a small-sized one to suit our page. The seed from which our plants were raised came from Mississippi—but it is very scarce so far to the West. It is more frequent as it approaches the sea-coast, and is generally found in open bushy places, or neglected sandy spots. The individual flowers soon fall, but the spike is nearly a month before all flowering is over. Torrey and Gray say the "corm" is esculent, on the authority of Dr. Boykin; and Dr. F. Peyre Porcher quotes Dr. Mellichamp as authority for the fact that it has valuable medical properties.

Its native place of growth is limited to the portion of our territory lying south of Georgia and South Carolina, and between the Mississippi and the Atlantic Ocean.

EXPLANATIONS OF THE PLATE.—1. Medium-sized flower spike, proceeding from the wood of last year's growth. 2. Young growth of the barren shoots.

PELLÆA ATROPURPUREA.

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PELLÆA ATROPURPUREA.

DARK PURPLE ROCK-BRAKE.

NATURAL ORDER, FILICES.

PELLÆA ATROPURPUREA, Link.—Smooth except some bristly-chaffy hairs on the midribs and especially on the dark purple and polished stalk and rachis, six to fifteen inches high; frond coriaceous, pale, once or below twice pinnate; the divisions broadly linear or oblong, or the sterile sometimes oval, chiefly entire, somewhat heart-shaped or else truncate at the stalked base; veins about twice forked. Root-stocks short and stout: stipes clustered. (Gray's *Manual of the Botany of the Northern United States.* See also Chapman's *Flora of the Southern United States*, Wood's *Class-Book of Botany*, and Williamson's *Ferns of Kentucky.*)

POETS generally sing of ferns in connection with the deep recesses of gloomy forests; with low damp situations; or if with more elevated places, they are where

> "The mist hovers over the fountain and rill,
> And curls in light folds on the slope of the hill."

Whenever the fern is mentioned it is usually when shaded ravines or flowery dells are to be adorned; when the poet strays near some sprayey fountain; or where trickling rills course through some quiet mead. Percival, whose lines we have quoted above, in another place is describing Greece from Mount Helicon; and, addressing one of the streams, sings:

> "Then be my guide,
> Wandering Termessus, upward through thy vale,
> And let me find, beneath the twisted boughs
> Of these old evergreens, coolness and shade,
> To make my toil the easier. Darkly rolls
> Thy current under them, and hollower sounds
> Thy hidden roar. I just can catch a glimpse
> Of yon deep pool, dark and mysterious,
> Sunk in its well of rock; and now from out

A tuft of seeded fern I see thee plunge,
Tinted with golden green, for there a sunbeam
Strays through thy arch of shade."

This pretty sketch would have been tame indeed without the help of the "seeded fern," which, by the aid of the straggling sunbeam, gave the golden green to the waters and at the same time the chief central point to the poet's picture. Most of us have pleasant remembrances of sylvan scenes, in which some graceful fern has taken what we might almost term a loving part. But all ferns are not like these. There are some which, if we may borrow a Shakespearian image of human things, are so delicately nurtured that they are only fitted to

"Caper nimbly in a lady's chamber,
To the lascivious pleading of a lute,"

while there are others again who rather delight in

"Mounting barbed steeds,
To fright the souls of fearful adversaries."

Our present species, *Pellæa atropurpurea*, is one of these brave courageous species. It does not grow in the rich soil of shaded woods, or seek the advantages of cooling streams; but boldly takes to the clefts of exposed rocks, or covers with its blue-green fronds the faces of dry and ruined walls. In such situations it often grows with a luxuriance truly surprising. Soon after the termination of the civil war, the writer was collecting plants among the smoked ruins of Harper's Ferry in Virginia, and these were covered with this fern, often with fronds ten inches long. Indeed it seems to prefer to associate itself with mortar, and the mural works of man. The abutments of the bridges across the Susquehanna river at Harrisburg were formerly covered with it, and may probably be so clothed still. In a wild condition it seems to prefer limestone rocks, though it is by no means confined to them. It grows luxuriantly in the soapstone quarries on the Schuylkill river above Philadelphia. Other observers have noted that it does well elsewhere than on

limestone. In the first volume of the "Botanical Gazette," Dr. J. Schenck says that it grows on a bare sandstone cliff in the lower Wabash valley of Indiana, "though it is usually thought to be found only on calcareous rock;" and in the same magazine Mr. H. E. Copeland says of some locations in Wisconsin: "It grows as thrifty on the sandstone as when growing on calcareous rocks in the southern part of the State." That the prevalent opinion is erroneous is further confirmed by Mr. Williamson, who in his "Ferns of Kentucky" remarks that "it is well distributed over the State wherever there are limestone cliffs, though it is occasionally found in sandstone formations."

It is interesting to notice how the knowledge of its geography has progressed. It was known to Linnæus as *Pteris atropurpurea*, having been probably made known to Europeans by Clayton, to whom it seemed so rare that he wrote to Gronovius that he found it in "a shady place among the roots of red cedars at Point-look-out, on the Rappahannock." This was previous to the year 1739. Michaux in the early part of the present century gave it a wider range by the expression, "Rocks in the Alleghanies." Beck in 1833 widened its range "from New York to Carolina." In Sir John Franklin's voyage to the Arctic seas in 1819–22, it was found in these high regions, though it did not attain there more than an inch or two in height. It has since been found by Lyell in Greenland; and, though it is not found continuously, but in isolated spots, it has a wide geographical range accorded to few other American Ferns. How nice it is in its isolation may be gathered from a remark of Dr. Coulter in the first volume of the "Botanical Gazette," who is describing it as it grows near Hanover, in Indiana. He says: "The apparent choice in the range of heights is very marked in the case of *Pellæa atropurpurea*, which is confined to a range on the topmost rocks, little if at all exceeding thirty feet in vertical height." From various sources we have accounts of its being found in Texas, New Mexico, Arkansas, Colorado, and all through the Rocky Mountains to arctic America. It does not seem to be

common on the seaboard. So far as we know, it has not been found in New Jersey, nor further northeast than Vermont.

The taxonomial history of our plant, or that which relates to its classification, has been a very chequered one. Linnæus, as we have seen, refers to it as *Pteris atropurpurea*, and this will be found in use by the earlier of our modern botanists. In the earlier editions of his "Manual" Dr. Gray has it an *Allosorus*, which he abandons in the later ones; while Thomas Moore, a noted English authority on Ferns, says in "The Treasury of Botany" that all those *Pellæas* which are not true *Pteris* "should be referred to *Platyloma*." After all it must be admitted that there is very little difference between some of the genera of Ferns. For instance, some would make *Pellæa atropurpurea* an *Allosorus* because the leaves have a thick leathery texture, and because the veins are not very apparent. But when the frond is held against the light, the venation is distinctly seen, as in our Fig. 3.

As a fern for cultivation, it has not appeared often as a success; but this is chiefly owing to a want of care in growing it. Though satisfied with harsh conditions in a state of nature, it demands a little petting before it willingly enters the service of man. Though Paxton says it was introduced to English culture in 1770, it still seems rare even in that land of good gardeners. A note in the volume of the "Gardener's Magazine" for 1879 says: "This pretty fern is found from arctic America to the Andes, where it grows at the height of from 8,000 to 10,000 feet. It is very rare in the country, and these notes were made from specimens in the Royal Gardens at Kew, where the plant does well. It should be placed in a well-drained position in the limestone, and a plentiful portion of sand and limestone must be added to the peat in which it is planted."

Our drawing was made from a specimen grown by Mr. Jackson Dawson, the fruiting portion, Fig. 3, being from our own Virginia specimens.

EXPLANATIONS OF THE PLATE.—1. Plant with young growth. 2. Barren frond from last year. 3. Portion of a fertile frond, showing the sporangia with their indusium along the edge.

EPIDENDRUM VENOSUM

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EPIDENDRUM VENOSUM.

VEINED TREE-ORCHIS.

NATURAL ORDER, ORCHIDACEÆ.

EPIDENDRUM VENOSUM, Lindley.—Scape tumid at the base, five to seven flowered; leaves two, linear-lanceolate, abruptly pointed; bracts short, ovate; sepals and petals spatulate-lanceolate, acute; lip three-parted, two-crested in the middle; the lateral lobes oblong, acute; the middle one wedge-shaped, notched at the apex; the claw partly adnate to the two-winged column. Scape about one foot high, invested with numerous short whitish sheaths. Leaves four to five inches long. Flowers eight lines long. (Chapman's *Flora of the Southern United States.*)

WHEN William Bartram made his journey to Florida in the interest of Peter Collinson, he discovered an orchid growing on the *Magnolia grandiflora*, and which is now known as *Epidendrum conopseum;* and, for a long time afterwards, this was regarded as the only orchidal epiphyte—that is to say, an orchid growing on trees—in the United States. But during comparatively recent years a second epiphyte has been discovered in Florida, and of the same genus as the other. The first knowledge the writer had of it was from some specimens sent to him from Florida, soon after the Secession war, by Mr. Wm. M. Canby, of Wilmington, Del. These were fastened to a block of wood with a little moss tucked in about them, when they grew well, and bloomed the following year. The first description of it in an American work appears in Chapman's "Flora of the Southern United States" of 1872, as quoted at the head of our chapter, where its discovery in Florida is credited to Dr. Blodgett. It appears, however, to be frequently met with by collectors in Florida, since its existence there was first made known. In the "Bulletin of the Torrey Botanical Club," Volume 6, Mary

C. Reynolds writes of the beautiful appearance it presents when growing on magnolias in that State; and in the first volume of the "Botanical Gazette," Mr. A. P. Garber, referring to the plants of Florida which attracted his attention when he first visited Eastern Florida in February, notes among his particular impressions this singular orchid then in fruit.

Though found so recently in the United States it is not a new species, for it was discovered in Mexico by Theodore Hartweg, who was sent to that country about the year 1836 and 1837 by the Royal Horticultural Society of London, to collect seeds and roots of the most beautiful plants he could find there for cultivation in English gardens. Hartweg says he found it growing on oak trees. In Florida it is reported as chiefly on magnolias; but it is worth noting that these plants are not parasites, deriving their sustenance from the living trees, but are only supported on the branches, obtaining their chief nutrition through their aerial roots, with perhaps a little aid from the dead bark of the supporting tree. When, therefore, we find the same species of orchid seeming to prefer one class of tree in one country as the oak in Mexico, and the magnolia in Florida, the reason is to be sought in the varying conditions of climate as regards light, shade and moisture. The seeds of our tree orchis, as indeed of all orchideous plants, are as fine as dust, and require nicely balanced conditions to germinate. There must be just so much moisture, just so much heat, and just so much shade, and these requirements vary in many species. In some countries, and for our species for instance, these exact conditions would be better secured on the branch of a magnolia than on an oak, while in others the oak would furnish them to better advantage. It is also worthy of note in connection with orchid seed that the conditions most favorable to germination are not those generally the best for the growth and subsequent flowering of the orchid plant, and these observations lead to some remarkable teleological conclusions. The little dust-like seeds, floating in the air till caught by some branch, would not germinate if the branch

were exposed to the full sunlight, and would be liable to be dried completely a few hours after a shower of rain. It is therefore only when there is continuous dampness and shade on the branch that the seed can grow; and this is of course best secured in the deep recesses of the forest, or on some peculiar class of trees, which at the germinating season of the year offers the best of these growing conditions. But though shade and gloom be necessary for germinating, the growing plant loves sunlight and a dryer air. The growth therefore is weak, and the flowers few in their usual place of growth; but if a tree, covered with plants, finds itself eventually exposed to full sunlight, the plants assume great vigor, and flower in profusion. We have in these cases a very valuable lesson as to the working of nature. She evidently cares far more for the welfare of the race than of the individual, for she makes the individual to grow in places not the most favorable for individual development, because the race is thus the better preserved. The individual plant therefore has very little power of selection. It has to do as it must rather than as it likes, and it is a great gain to the student of nature to clearly perceive this law.

We may regard it as a piece of good fortune that this beautiful species has wandered up through the ages from Mexico to our territory, so that we can include it among the illustrations of the native flowers of the United States. For it will give us a faint idea of the great beauty of tropical forests in which epiphytal orchids are exceedingly numerous, and far excel in gorgeousness the species illustrated here. The chief variations generally are in the form and markings of the lip, as what we might style the sixth petal in an orchid flower is called. Most students know that an extensive type of flower is that which has three leaves called sepals in one whorl making the calyx, and then three more making the inside set of petals or the corolla; but even these whorls are formed in a line, spiral though it be. The three divisions in each whorl are not formed together, but one after another, and thus in the whole six there are a first and a

last. If we look at this orchid flower we see that if the lip had been made like the other divisions, we should have had a six-parted corolla of a very common type, and in making orchid flowers nature has done little more than busied herself in seeing how different she could make the lip from the other five divisions of the six-parted flower. In the present case the lip is not much different from the other divisions. It is a little broader, but depends chiefly for its distinctiveness on its incurved base. The beautiful rose-colored veins give it its chief attraction, and it is from this that it derives its specific name *venosum*, which is Latin for veined.

Our description tells us that the plant is "tumid at the base." These bases are known to gardeners as pseudo-bulbs, that is to say, "false" bulbs; but really there is no difference in their essential nature from true bulbs. They are both formed from the thickened and united bases of the leaves, but the true bulb is generally formed under ground. New pseudo-bulbs are formed every year as the root stock grows. At Fig. 1 we see the remains of the pseudo-bulbs of years gone by, which have had leaves, and probably flowers. At Fig. 3 we have the more recent ones, which in a few years will look as Fig. 1. From these new bulbs, the new roots, Fig. 2, come, and by which they feed and are attached to the supporting tree. The roots always come out from the new bulb. After the leaves have been fully formed, roots will never come out again from the bulb that bears them.

EXPLANATIONS OF THE PLATE.—1. Old pseudo-bulbs, at what was once the termination of the root stock. 2. New bulbs at present terminus of the creeping root stock. 3. Aerial root. 4. Complete plant, full size, in flower. 5. Branch of tree on which it is growing in Cambridge Botanical Garden.

DENTARIA LACINIATA.

L. PRANG & COMPANY, BOSTON.

DENTARIA LACINIATA.

CUT-LEAVED TOOTH-WORT.

NATURAL ORDER, CRUCIFERÆ.

DENTARIA LACINIATA, Muhlenberg.—Root-jointed; stem-leaves mostly three, whorled, ternately divided; leaflets lanceolate or linear, lobed and toothed; the lateral ones two-parted, those of the root similar or sometimes wanting; racemes few or sometimes many-flowered, often shorter than the leaves; flowers white or pale-purple. Stem from four to twelve inches high. (Chapman's *Flora of the Southern United States.* See also Gray's *Manual of the Botany of the Northern United States,* and Wood's *Class-Book of Botany.*)

HIS is one of the earliest wild flowers of spring. According to Chapman it commences to flower in March in the South, and in the North it is seldom later than May. These early flowers are always welcome. As a rule those of summer and autumn boast of gayer colors. But after the dreariness of winter has passed away, and

> "The sun is on the waters, and the air
> Breathes with a stirring energy; the plants
> Expand their leaves, and swell their buds, and blow,
> Wooing the eye, and stealing on the soul
> With perfume and with beauty,——"

we are not particular then about the style of beauty, and are pleased with a very slight perfume. Our "Tooth-wort" is, however, not without real claims on the lovers of showy things. A correspondent of the "Garden," who has been recently cultivating it in England, says: "This is a very handsome dwarf cruciferous perennial, the large, rosy-purple flowers being rendered more conspicuous by the bright green leaves. It is a North American plant, and is infinitely more beautiful than the *Dentaria bulbifera,* the common 'coral-root' of the woods and copses of some of our southern counties."

It may be well here to explain to the wild-flower collector that the "cruciferous order" to which our perennial belongs, though a very large one, is very easily recognized. Cruciferous, or cross-bearing, refers to the petals, which are in a cross-like series of four. Then the stamens are arranged so that there are four of equal length, with two shorter ones; and it was from this fact that the Linnæan class of Tetradynamia was so styled. There may be some plants in other orders with four petals, but they are not likely to have this peculiar arrangement of the stamens with the other condition. In addition to this there is an absence of bracts, or diminutive leaves along the flower stalks, and all these circumstances together will generally enable the student to decide on the natural order when it is met with; and herein we may see the advantages of the natural over the old sexual or artificial systems. Many points are taken into consideration, and we are less liable to go astray than when only one point is regarded as the chief foundation stone.

It may be noted that the English writers refer to our plant as the "coral-root," and not "Tooth-wort" as we have it, and this seems to be really the older name. The "Dentaria," or "Tooth-wort," of the oldest writers of more modern times, was a plant of the order *Orobanchiaceæ* or "Broom-rapes," in which the "scales of root represented teeth." This is worth remembering, because some of our modern authors, in explaining why our plant is called Dentaria, tell us it is from *dens*, a tooth, "because of the scales," etc., when really the root of our plant has no scales. The old definition has been carried to the new plant. In view of the incongruity Mrs. Lincoln, in her "Botany," may be justified in remarking that it is as likely to have had its name from being, perhaps, an ancient remedy for the tooth-ache!

In regard to medical virtues our Tooth-wort does not seem to have much to boast of. Dr. F. Peyre Porcher makes no mention of the plant. Darby, in his "Botany of the Southern States," says the roots are pungent; and the "Treasury of Botany" says: "The roots of *Dentaria diphylla* (scarcely different from our

species) have a pungent, mustard like taste, and are used by the natives of the mountains of North America, from Pennsylvania to Canada, instead of mustard, under the name of Pepper-wort." This pungency is shared in by the roots of other closely allied plants of the cruciferous order, of which the horse-radish, the common garden radish, and even the cabbage and turnip under some circumstances, are familiar examples. But the ancients believed it possessed greater merits than that of a mere condiment. Culpeper, the quaint old herbalist, says of the English form: "It is under Mars, and is a good vulnerary. It is recommended to stop all kinds of fluxes and hemorrhages; helps to consolidate wounds and fractures; especially the root." Salmon, another herbalist of the time of Queen Anne, says, pointedly, "they are dedicated to the curing of wounds."

This medical character is of course drawn from the European kinds, and chiefly from the *Dentaria bulbifera;* but the species are so closely allied that it is difficult to distinguish them, and hence a property found in one may be looked for in most. In the case of our present plant, several species have been made of it by various botanists at different times. When referring to one yet supposed to be distinct, *Dentaria heterophylla*, Mr. Sereno Watson says, in his Bibliographical Index, "uniting *D. laciniata*, *maxima*, and *multifida*." How well justified Mr. Watson is in this suggestion is confirmed by a remark of the editor of the "Botanical Gazette." In the first volume he says: "It is one of our earliest spring flowers, and one of the most variable and perplexing species I ever met. A long list might be made of the various forms in which it occurs. *Dentaria maxima*, *D. heterophylla*, *D. laciniata*, and *D. multifida*, undoubtedly run together in this locality. Specimens of these different species have been found growing in the same patches, and even from the same root! The leaves vary from entire to finely dissected. In some specimens there are three leaves in a whorl; in some there are but two leaves, opposite or alternate. In short there is no kind of division or position of leaves which is not represented in this

species." What we have quoted is a very good lesson on leaves, for modern botanists, in distinguishing species, do not place near as much dependence on characters drawn from them, as those botanists did who lived in more ancient times.

Dentaria laciniata does not seem to have been found by the earlier botanists who examined the flora of our country. Muhlenberg, of Lancaster, Pennsylvania, sent specimens, and proposed this name to Willdenow, who so describes it in Willdenow's "Species Plantarum," in 1800. Michaux, the French Botanist, published his work on the "Flora of North America" in 1803, and apparently not identifying it with Willdenow's plant, named it *Dentaria concatenata*, and which being a later name is carried to the list of synonyms.

Our cut-leaved Tooth-wort is peculiar in not being found abundant in any one place, and yet being scattered over a wide extent of country. It is seldom found in sufficient quantity at one time to have any material effect on the character of the wild scenery; and it has therefore to be sought for and enjoyed for its own individual interest and beauty. Along the Wissahickon, from whence our specimen was taken, it occurs sparingly among rather damp rocks, or under the partial shade of hemlock spruce trees; and in almost all localities it has trees for its most intimate companions. It does not produce seeds very freely, and, as it has therefore to depend mainly on its roots for continued existence, it has not the same chance for a liberal distribution as if aided by seeds.

It extends across the continent in northern latitudes, and through most of the Atlantic portions of the United States.

ANTIRRHINUM SPECIOSUM.

L. PRANG & COMPANY, BOSTON.

ANTIRRHINUM SPECIOSUM.

GAMBEL'S SNAP-DRAGON.

NATURAL ORDER, SCROPHULARIACEÆ.

ANTIRRHINUM SPECIOSUM, Gray.—Shrub, two to four feet high, somewhat pubescent, leafy throughout: leaves oval or oblong, short-petioled, coriaceous: corolla "scarlet" or pink red, hardly an inch long, thrice the length of the lanceolate sepals, and the tube thrice the length of the narrow lip. (Gray's *Synoptical Flora of North America.* See also Brewer and Watson's *Flora of California.*)

IT is only by rare good chance that we have been able to illustrate this plant, which is one of the rarest as well as of the most beautiful of the wild flowers of the United States. It was first collected by Mr. William Gambel, in 1842, on the island of Catalina, off the coast of California, and does not appear to have been found again till 1875, when it was gathered on another island off the same coast—Guadalupe—by Dr. Edward Palmer; and it was from seeds collected by him that the plants were raised in the gardens of the Arnold Arboretum of the Bussey Institute, near Boston, from which our artist made the drawing for this plate.

The plants collected by Mr. Gambel were examined by Mr. Nuttall, and described by him in the first volume of the "Journal of the Academy of Natural Sciences of Philadelphia," under the title of "Plantae Gambelianæ," and this particular one believed to constitute a new genus, and which he called *Gambelia;* but which has since been decided by Dr. Gray not to be distinct from *Antirrhinum*, the well-known "Snap-dragon." Mr. Nuttall himself seems to have perceived the close relationship of the plant to *Antirrhinum.* He says of it: "A bush about three to four feet high, full of bright scarlet flowers, and apparently an evergreen;

corolla about an inch in length and tubular, with a conspicuous saccate spur at the base. Though so different in habit, yet closely allied to *Antirrhinum*,—the tubular corolla, smooth palate, and entire stigma being all that distinguishes it from that genus. The seed may also prove different, but that is at present unknown. It is a plant highly worthy of cultivation, and flowers early in April." It seems to have been one of those cases where the distinct habit and appearance were relied on to furnish characters that descriptive science fails to perceive, for few untutored persons would imagine there was any relationship between our plant and the familiar Snap-dragon.

It is to be regretted that the attempt to honor Mr. Gambel in this genus could not be sustained, for he seems to have been one of those very meritorious persons, who, triumphing over early obstacles, succeed by their perseverance in serving their fellows, and often, as in this instance, at the expense of their lives. He passed the early part of his life in Philadelphia with his mother and sister, who were in humble circumstances. He pursued successfully a course of study in the medical department of the University of Pennsylvania, taking the degree of M. D., in March, 1848, adopting for his inaugural thesis "Organic Forms or Species." His death occurred on the 13th of December of the year following. His services to science commenced in 1842, when, at the solicitation of Mr. Nuttall, whom some think was his uncle, he made an overland trip to California, collecting numerous birds and plants, returning early in the spring of the following year, when he was made a member of the Academy of Natural Sciences for his distinguished services. He was subsequently elected Recording Secretary of the Institution, which office he resigned in order to make another collecting tour across the continent, on which journey he set out in the spring of 1849. His track was from Independence, Missouri, to the Kansas river, and from thence to Fort Kearney. From here he struck off on a comparatively unknown and rugged trail in the hope of getting more novelties, crossing

the Sierras at the head of the Sacramento valley. The trials and sufferings he encountered on this route were terrible, and he had scarcely reached the land of California when he was seized with typhoid fever and died. A letter to the Philadelphia "North American," in 1850, from one of his companions, says: "He sleeps in peace beneath the towering pines which cluster on a sunny hill-side, stretching up from the bright waters of the Rio del Plumas. He has departed early, but not unhonored. Philadelphia owes to his memory a lasting tribute of respect for his science, virtue, worth, talent, and energy." The exact spot wherein was laid all that was mortal of this promising young explorer will now perhaps never be known; and his lonely grave in what was then the great Pacific wilderness seems sadly suggestive of the lines of Bryant:

"Take the wings
Of the morning, traverse Barca's desert sands,
Or lose thyself in the continuous woods
Where rolls the Oregon, and hears no sound,
Save his own dashings—yet, the dead are there."

Our very pretty wild flower seems confined to these small islands along the Californian coast, and this fact has led to interesting speculations as to the origin of this and some other species so confined within such restricted limits. Guadalupe Island, where Dr. Palmer found this plant, is only twenty-six miles north and south, and only ten miles across on the widest line, with volcanic rocks and extinct craters. Of the flowering plants Dr. Palmer collected there, one-fifth have so far not been found in any other part of the world! Mr. Sereno Watson believes the flora as of the same primordial origin as that of the mainland of California, and that it shows that at some remote period there were closer connections with California than now exist, but that the land has been submerged, taking with the submergence whole groups of families, and leaving here and there a few scattered individuals of some species to tell us the tale of their comrades' misfortunes.

Dr. Palmer says he found our species "Frequent in the crevices of high rocks in the middle of the island, very ornamental, the bright scarlet flowers continuing all summer." This fact may help those who desire to cultivate the plant. Though ice forms sometimes an inch thick on Guadalupe Island, it is not likely the species would be entirely hardy enough to endure the open air of any but the extreme Southern States. But it can be kept alive in what are known as cold-houses, and it would probably well repay any care in this respect by blooming freely most of the next summer, from the earliest spring months, when planted in the open ground. It is easily raised from cuttings, as we know by some which are growing freely as we write. There could certainly be nothing more beautiful in one's garden than a shrub "three or four feet high," covered by such showy colored flowers as appear in our plate.

ADIANTUM · CAPILLUS-VENERIS.

L. PRANG & COMPANY, BOSTON.

ADIANTUM CAPILLUS-VENERIS.

TRUE MAIDEN-HAIR FERN.

NATURAL ORDER, FILICES.

ADIANTUM CAPILLUS-VENERIS, Linnæus.—Frond ovate-lanceolate, twice to thrice pinnate; pinnules very delicate, oblique, broadly wedge-shaped or sometimes rhomboid, rather long-stalked, the upper margin deeply incised and fruit-bearing or sterile and dentate; stipe slender, ebeneous; rachis almost capillary, flexuous. (Chapman's *Flora of the Southern United States.* See also Eaton's *Ferns of North America.*)

ONCE in a while some reader of our "Native Flowers and Ferns" writes that it would be "so nice" to know more about the cultivation of these pretty things. They forget for the moment that we are dealing with wild flowers, and that it is not possible to tell them, from experience, how to cultivate that which has not been cultivated. In the present case such friends may be gratified, for the True Maiden-hair is one of the best known of cultivated ferns. It is extensively grown by florists for ornamental work, and is a frequent denizen of fern cabinets. It also adapts itself better than many other ferns to room-culture; and, if but a few ferns are favorites in some small greenhouse, the True Maiden-hair is very likely to be one found among them. If these greenhouses have any slightly damp, or partially shaded places on their walls, it is more than likely that this plant will be found spontaneously there; not only taking good care of itself, but in many cases showing, by its luxuriance, how much it rejoices in its freedom. The fronds in these cases are often a foot in length, which is a good average growth, though Dr. Chapman, in the work we have quoted, gives one foot as the minimum, and speaks of three feet as the length they some-

times assume in the Southern States. This must be very unusual. The one given in our illustration is about the size as generally seen. Florists grow it in any ordinary potting soil, mixing with it about one-half of broken bricks, old pots, or stones. It does not endure the coldest winters in the Northern United States, but is nearly hardy, and of course will thrive in any cool greenhouse, as well as grow nicely in quite warm places. Indeed, for adaptation to many situations, it is one of the most remarkable ferns known; and this has been noted by those who have observed it in a wild state as well as by those who are familiar with it under culture. It is found in most parts of the world, and Sir William J. Hooker tells us that it is very abundant in the south of Europe, where he has seen it "lining the inside of wells with a tapestry of the tenderest green." On the other hand, Dr. C. C. Parry, in his "Botanical Observations in Southern Utah," in "American Naturalist" for 1875, says: "Apparently quite out of place in this arid climate, we notice quite frequently on the perpendicular face of moist sandstone rocks Adiantum Capillus-Veneris." In Florida it seems to prefer a situation different from either of those Dr. Parry and Sir William J. Hooker describe. In the "Bulletin of the Torrey Botanical Club," for September, 1877, Miss Mary C. Reynolds says: "I was made happy by finding, under the direction of Mr. Chamberlin, the beautiful *Adiantum Capillus-Veneris* growing in rich hummock-land, where wild oranges and other trees made a constant shade. Little mounds or depressions were the haunts of my charmer. Last year's fronds were all gone, or rather the pinnae had dropped, leaving the shining black, wiry stems standing upright and spreading out their slim fingers, while the baby fronds were coming up around them. Some were old enough to be well fruited, while others were very tender and of a lovely pink color."

It is remarkable that a plant capable of inciting such pleasant imagery, as is exemplified in the language of the writers quoted, should not have taken a distinguished place in classic poetry;

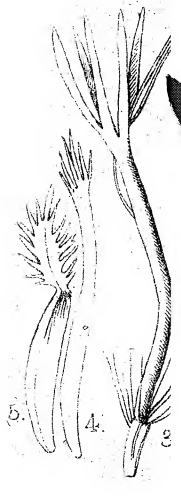
but we can recall nothing in particular as we write. This is still more to be wondered at when we remember that it is a plant not only known over the whole world, but is referred to in some of the oldest writings extant; its present names indeed having been handed down to us from antiquity, and their meanings, so far as these may be applicable to our plant, in a measure lost. During the middle ages its proper name was Capillus Veneris; and because of this having once been its proper name is the reason why the capital letters are yet employed, though, under the binomial system of Linnæus, it is now but an adjective to *Adiantum*. Capillus Veneris—literally, the hair of Venus, or perhaps of any fair lady—would seem to be from the mass of hair-like stipes, such as is referred to by Miss Reynolds above quoted; but as some erudite English authors—notably, Withering—observe, there are many others which may have equal claim to such a distinction. The Greeks of the present day, in whose country now as in ancient times the plant is common, give it the popular name of *polytrichum*, or "many hair;" while we, in our day, apply this name to a coarse hair-like moss. In like manner the generic name, *Adiantum*, is the one originally applied to it by Dioscorides, the ancient Greek physician and author, but for what reason is not known. Its literal meaning is "dry;" and Pliny, the Roman writer, conjectures that it may have been given to the fern, because when dipped in water the frond seems still dry when withdrawn. But here is the same objection as in the other case, that other ferns and other plants have the same appearance under such circumstances; and we have to rest satisfied with merely knowing that these are the ancient names as given to this plant.

Among the interesting matters connected with this species is the quantity of juice which the fronds contain. It is said that one pound of the fresh herb will give nearly one pound of juice, as if the whole plant were but water with a little filmy matter thrown in. This juice was the basis of a beverage once popular in France; but a querulous English writer of the last gener-

ation says that most of the medical or epicurean virtues it possessed was derived from the Narbonne honey, orange-flower water, and other nice things, which were put into it. Syrup of capillaire, however, the basis of the beverage in question, has lost its popularity now.

As already noted, the True Maiden-hair Fern—called "True" because among some half a hundred species of *Adiantum* now known, this is the species which gave the name of Maiden-hair to the whole genus—is found in all parts of the world,—in Europe, Asia, Africa and America. On our continent it extends south to the Amazon, and north to the Potomac river. It is not recorded from Colorado, but is found in the Indian Territory and in the southern part of California. Specimens for drawing were kindly sent by Dr. Wood, of Wilmington, North Carolina, but were not in fruit. Our plate is from a Texan specimen contributed by Mr. Jackson Dawson, of the Arnold Arboretum.

EXPLANATIONS OF THE PLATE.—1. Full-sized plant from Texas. 2. Enlarged pinna, showing the veins and indusium. 3. Indusium lifted, showing the sporangia.



CENTAUREA AMERICANA.

L. PRANG & COMPANY, BOSTON.

CENTAUREA AMERICANA.

AMERICAN CENTAUREA.

NATURAL ORDER, COMPOSITÆ.

CENTAUREA AMERICANA, Nuttall.—Stem erect, sulcate, sparingly branched; lower leaves oblong-ovate, repand-dentate, upper ones lanceolate, acute, all sessile and glabrous; heads few or solitary, very large; pedicel thickened at the summit; ray flowers twice longer than the disk; scales with a pectinate-pinnate, reflexed appendage. Stems two to four feet high, with large, showy, pale-purple heads. Appendages straw color. (Wood's *Class-Book of Botany.*)

OUR text-books tell us that "Centaurea was so named from Chiron, the centaur, who first discovered the medical virtues of the plant." It may be remarked here that ancient history is so mixed—that which may be true confused with that which is mere fancy—that we are liable to take the whole of ancient history as of little account. As we generally understand the "centaur" we have the fable of Ovid in mind, wherein the daughter of a goddess in pity is changed into Enippe—half woman, half horse—in company with the half-beast centaur already existing,—but it appears from those who have made ancient history a study that certain Thessalonians first tamed horses so as to ride upon them, and thus appeared to their frightened neighbors, who observed them at a distance, as beings who were part horses and part men. Out of this it is supposed the fables come. One of these Thessalonians, "a centaur" named Chiron, was seriously wounded by Hercules; but by the discovery of the healing virtues of some plant he saved his life. This Chiron appears to have been a veritable personage, but the plant he found is a sort of gentian, referred to by Breyne, who wrote a work called "Centuria Plantarum," in 1678, as *Chironia*,

which name was adopted by Linnæus as *Chironia Centaureum*, and is believed to be the *Centauria* of Dioscorides, and also the plant which should be identified with Chiron's history. The genus which we now call *Centaurea*, and to which our present species belongs, contains the plant which seems to have been referred to under this name by Theophrastus, a Grecian author who died 288 years before Christ, by Lucretius, and by Virgil; and which is now *Centaurea Centaurium*, but how it is connected with "Chiron, the centaur," is not clear. The earlier of extant English authors on Botany seem unable to unravel the puzzle, so for distinction they called the gentians the "lesser centaury," and those which we now refer to the genus the "greater centaury." Instead of being able to heal a wound, such as that from the poisoned arrow from which Chiron suffered, these plants have no medical value whatever.

The genus contains numerous representatives in the old world, but in the new has but a single indigenous species, *Centaurea Americana*, the one we now describe; and this is confined in the United States to the dry regions of Texas, Arkansas, and the Indian Territory, where it has a singularly beautiful appearance, being often the only showy plant on the dry sterile soil, for the pretty ones are generally to be found only along the water courses, or where in low places the ground may be moist. Still it has no objection to more favorable locations under other circumstances, as its luxurious growth and fine blossoms when under garden culture show. At least this dry location is the experience of the writer of this, who collected it in northern Texas. In the "Plantæ Lindheimerianæ," where it is marked as being found near Houston, in Texas, it is noted as growing in "moist, fertile prairies." Rothrock, in the botany of the Wheeler Expedition, notes its collection in Arizona, but does not give the nature of its location. It varies somewhat, and the particular form we have illustrated, first collected by Mr. Elihu Hall in Texas, is known as the "Variety Hallii."

Our plant is of particular interest on account of its botanical

features, as well as for its native beauty, and its easy adaptation to garden culture. As the student knows, the bracts which go to make up the involucral scales in this natural order, and which in this *Centaurea* have a pretty comb-like appearance, are but leaves which have been suddenly and nearly suppressed. The whole head of flowers is indeed a long stem which has been drawn into a small compass, as would be a wire spring pressed down. One phase of stem growth ceases when the flower begins to form. The flower is indeed the effort of a second growth-wave, and, instead of the leaves winding round the branch as in the first wave of growth, the changed leaves and axillary buds as scales and flowers, wind round the receptacle. Now in view of this morphological law we might expect the numerical parts in the second wave to accord somewhat with the first,—that is to say, a plant with leafy stem should have a great number of involucral scales or other floral parts. We do not always see this correspondence, because the parts will often be wholly absorbed, united with each other, or suppressed; but we often may, and it is especially to be seen in the case of the American Centaurea, which has a very leafy stem, and a correspondingly numerously-bracted involucre. Again, the pectinate, or comb-like appendage to the scale, is interesting as showing a power in the genus to have pinnately parted leaves. There is nothing else to indicate this power in this particular species, for the leaves are remarkably entire; that is, showing no indications of any lobes or parting along the edges. But on seeing these pinnatifid bracts, and knowing what we now know of their typically leafy character, a student meeting this species for the first time he ever saw one of the genus, might fairly expect to find pinnately parted leaves in some of them. And this he really may do, for there are other species with such divided leaves. The much swollen upper portion of the hollow stem is extremely interesting. The numerous grooves in this portion give some indication of the great numbers of primordial leaves which have gone to make up this huge compound flower. The normal

growth of a stem of a composite is made up of a spiral of five leaves; as these over-lap in the growth-coil the outer edge of each leaf makes a light ridge. There are, therefore, five distinct ribs in many composite stems, and which when the stem is cut across so often give it a five-angled appearance. As the spiral has not been drawn out in forming the head as in the stem growth, the united bases of the leaves cannot take on the five-angled plan, but are numerously arranged around a common centre, and afford us some idea of their great number by the little ridges we see.

EXPLANATIONS OF THE PLATE.—1. Opening flower. 2. Nearly mature flower, showing the involucral scales. 3. Floret with young achene at the base. 4. Scale from the inner part of the flower. 5. Scale from the exterior.

ERIGERON MUCRONATUM

L. PRANG & COMPANY, BOSTON.

ERIGERON MUCRONATUM.

POINTED ERIGERON.

NATURAL ORDER, COMPOSITÆ.

ERIGERON MUCRONATUM, De Candolle.—Stem erect, terete, somewhat glabrous or sub-puberulous, branched; leaves lanceolate, narrowed at the base, somewhat glabrous, ciliate, entire or occasionally lobed above the middle, the lobes and apex of the leaves tapering to a thick mucro or point; heads few, peduncled; involucral scales linear, subulate, puberulous; ligules in two series, double the width of the disc, white. (De Candolle's *Prodromus Systematis naturalis regni vegetabilis*, vol. v., p. 285.)

WE have here a plant which has had no popular history, nor hitherto any history at all in connection with the Flora of the United States, for it is only recently that it has been known as growing within our territory; and for this knowledge we are indebted to the botanists of the Cambridge Botanic Garden, Mass., from whence was obtained the specimen from which the drawing was made. As it is not described in any American work at hand, we have taken our description from De Candolle, who first named and described it in 1836 from living plants grown in one of the European Botanic Gardens from seeds received from Mexico. Though with so little already known of it, we are glad to have the opportunity of figuring it, as it offers many excellent lessons both in botany and in beauty.

It is of course understood by most students of plants that every part is made up or grows out of some other part; but it is not so well understood, though it is believed to be as true, that one species is made up or grows out of some other species. The knowledge of the first constitutes morphology; the second study is known as the doctrine of evolution. Our present species,

Erigeron mucronatum, the pointed-leaved *Erigeron*, is well adapted to illustrate both these divisions of botanical science.

As regards the change of leaves to flowers, the manner varies with different species. We like to refer to it in composite or aster-like plants, for it is seldom that we proceed to trace it in any one of them without learning much of the immense amount of variety which nature works out of a few simple materials. It may be remembered that there is not only growth in plants, but that growth is in waves or rhythms, and that there is a succession of these waves—the degree only varying with the species. In the present one, we see that the earliest leaves—those near the root of the plant—are small, slender, and rather blunt. As the growth-wave proceeds, it gathers force, the leaves become larger, and, when at what we may term the maximum force of the growth-wave, deeply lobed. As the force declines, the stems become weaker and are long drawn out, the leaves becoming again smaller, and resembling those at the base or beginning of the movement. The growth-wave is nearly exhausted, and growth almost at a stand-still, when a second and weaker wave begins, and this has more spiral activity than the first, and results in the general calyx of the compound flower, or involucre, as it is technically called, every scale of which is a changed leaf.

Only for the rapid torsion, and for the peculiar position as under the second wave of growth, these now involucral scales might have been leaves drawn out on a stem just as we see in the earliest phase of growth. But a third distinct wave commences when the flower is to be formed, and the ray florets may be compared with the little root-leaves forming the beginning of the first wave as already noted. They are more slender, but there is the same tendency to narrowing at the base, and to obtuseness at the summits. It is particularly interesting to watch these phases of growth in living composite plants. The actual rest between the several waves can in many cases be noted, and often timed.

Each floret in a compound flower is a metamorphosed branchlet with its stem and leaves. The corolla is probably formed of five primordial leaves; generally united into a tube (Fig. 3) in the central or disc flowers, but bursting on one side and looking like a single strap in the ray florets. The peculiar force which accomplishes this rolling up process in the formation of the tube, or in opening the tube to make a strap-shaped floret, whichever it may be, varies in different genera. Usually, the outer row alone is strap-shaped and the rest all tubular, or all may be strap-shaped, or the whole tubular. But a peculiarity of this *Erigeron* is that there are two series of strap-shaped corollas, while all the rest are tubular as in Fig. 3.

But in some species of plants there are not only transitions of leaves, but transitions in branches, and it is one of the fortunate features of this species that it affords the illustration. Some species of *Erigeron* have a matted root-stock; others send out thread-like stems, with perhaps a few very small scales, terminating in a bud which eventually becomes a young plant, as in the runner of a strawberry. In the case of the strawberry there are instances known where the runner erects itself and becomes a bunch of flowers with leaves, and finally fruit. We thus know that the thready runner and the flowering branch are essentially the same thing, but, under the action of some peculiar phase of growth force, one has changed its manner and form for the other. In our present species we have, in Fig. 2, a branch just intermediate between its own flower stems, and the thready runners or stolons of other species; and we see how readily the one may be transformed into the other.

Now these peculiar gradations which we find in the individual, and the science of which we know as morphology, exist in the same degree between species, and which then constitute what we call the science of evolution. In these *Erigerons* it is very well marked. Taking three closely related American species, *E. bellidifolium*, *E. mucronatum* and *E. Philadelphicum*, we have the last with matted root stocks, the first with long thready stolons,

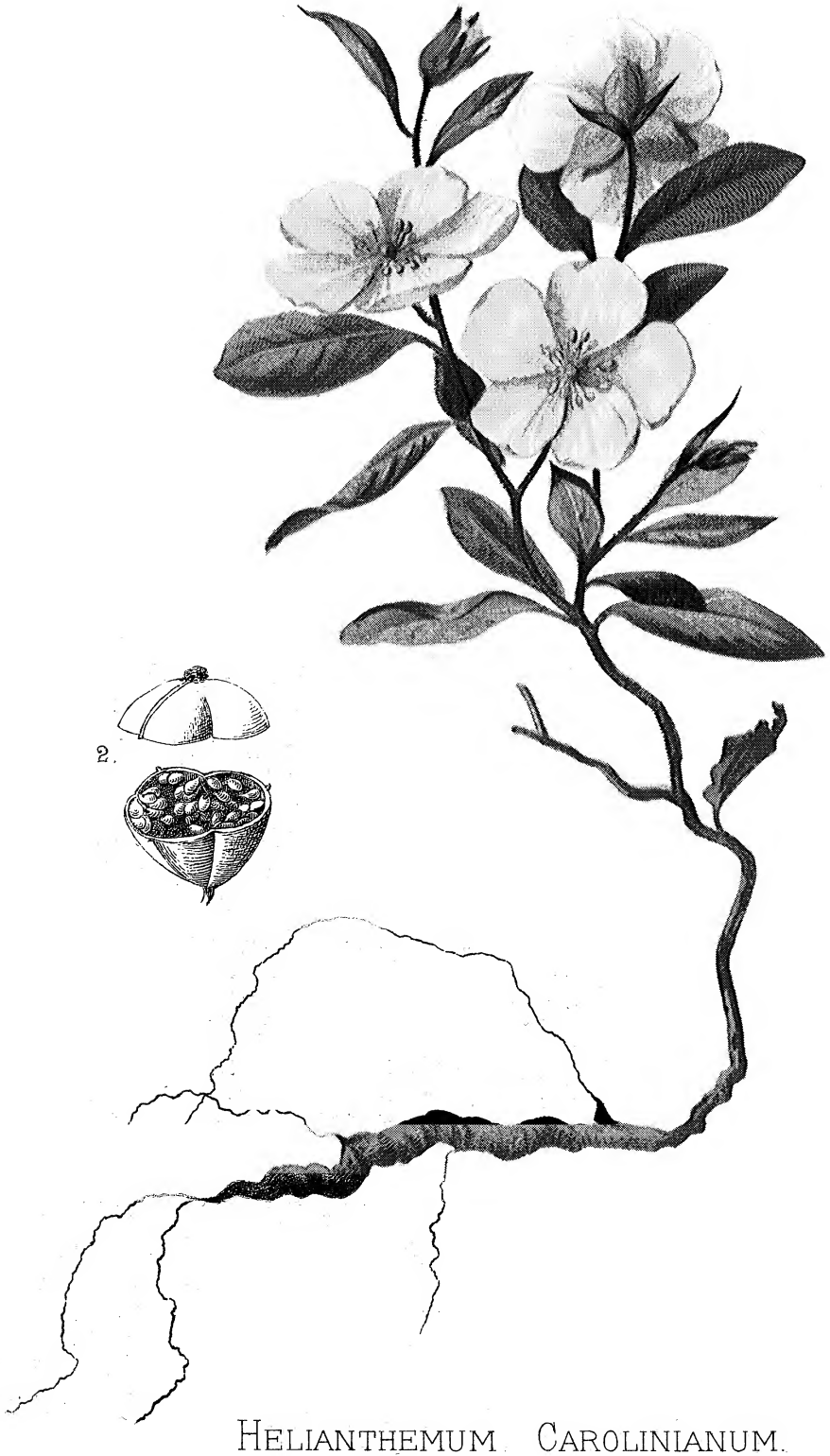
and the second intermediate, as it were, having trailing, barren branches, which sometimes root, and at other times are partially erect, as if with a little encouragement they would become flowering branches.

The botanical lesson has been so interesting that little room is left to analyze the plant's beauty. Many of the genus are so coarse in their features that this one surprises by its gracefulness and elegance. It has little to offer in the way of contrast; its claim to distinction lies in its variety of slender lines which all run imperceptibly into each other.

There is much classical history connected with the genus, though not of the species which, in our desire to profit by the lesson it offered, we shall have to pass for the present, hoping to illustrate another species soon.

In English gardens it is erroneously known as *Vittadenia triloba*.

EXPLANATIONS OF THE PLATE.—1. Flowering stems. 2. A trailing, barren stem. 3. Disc flower very much enlarged.



HELIANTHEMUM CAROLINIANUM.

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HELIANTHEMUM CAROLINIANUM.

CAROLINA SUN ROCK-ROSE.

NATURAL ORDER, CISTACEÆ.

HELIANTHEMUM CAROLINIANUM, Michaux.—Hirsute; leaves lanceolate, denticulate, acute, short-petioled, the lowest obovate, crowded; flowers large, solitary, borne above the axils. Stems six to twelve inches high, ascending from a shrubby base. Flowers one inch wide. (Chapman's *Flora of the Southern United States.* See also Wood's *Class-Book of Botany.*)

THE ancient fables connected with flowers often seem common-place when taken as they stand, but there are often beautiful ideas beneath them, whether the authors intended so or not, and which even the dullest may perceive and the most intellectual admire. Indeed they should be regarded as allegories rather than as fables, if we would derive full benefit from them. There is, for instance, the story of Persephone, the charming daughter of Ceres, who for her great beauty was carried by Pluto to his dreary realms; and who for some fault could not be fully restored to her fond mother's arms, but was compelled to remain six months in the subterranean regions, and return to earth the other six only. The poet describes how ravishing was her annual visit, surrounded as she was by the beautiful blossoms and other accessories of the vernal season. In like manner we may feel in a measure carried to the Plutonic regions when winter comes to drive us away from the green fields and lovely flowers; and when our six months of cheerless solitude shall have passed, to feel with Persephone the pleasures which come with the returning flowers of spring.

Our present subject is a spring flower—one of those which even Persephone might welcome. It comes from the southern

portion of our country, of which Longfellow in "Evangeline" says:

> "Beautiful is the land, with its prairies and forests of fruit trees;
> Under the feet a garden of flowers, and the bluest of heavens
> Bending above, and resting its dome on the walls of the forest."

The poet is referring to Louisiana, where our plant is found as well as in the Carolinas where Walter first found it, and which suggested to him the name of *Cistus Carolinianus*—the Carolina Rock-rose. For our specimen we are indebted to Mrs. Lungren, of Volusia, Florida, where in the month of March it is one of the numerous early flowers of that flowery land, and clothes many a dreary sand-hill with its golden beauty.

In the past our plant would have been a *Cistus*, an old name employed by Pliny, the Roman writer of the beginning of the Christian era, to designate a "branching plant with leaves like thyme," and which may very well have been some of the European species. They abound in the south of Europe, extending nearly to Africa, and may perhaps embrace a hundred species. Most of these species are crimson, brown, or white, and were known as "Rock-roses," from their usual place of growth, and from the general form and color of the flowers giving the impression of miniature roses. One of these species had yellow flowers, like small suns, and was called from this fact *Cistus Helianthemum*. Jussieu divided the genus. He found some having five to ten valves or divisions in the capsule, and these he regarded as the true *Cistus*, while others had uniformly but three (see our Fig. 2), and these he kept under the old name of *Helianthemum*. This note from history is useful in connection with the meaning of the name in its application to our plant. Many of our modern text-books tell us "it is derived from two Greek words, *helios* the sun, and *anthos* flower; because the flower only opens when the sun shines," an explanation which would as readily apply to those known under *Cistus* as under our *Helianthemum*. Our text-books also give the name "Rock-roses" to the *Helianthemum* as well as to the genus from which it was

taken. To save confusion we have ventured to add a prefix, and so have made "Sun Rock-roses."

There are many interesting facts probably remaining to be discovered in connection with our plant and its American comrades. The original species of Europe, which gave its name to the genus, has sensitive stamens, falling back on the petals if touched when the flower is expanded during sunshine. Darwin, the grandfather of the present illustrious philosopher who wrote near a hundred years ago, seems to have been aware of this fact. In his poem, "The Loves of the Plants," he says:

> "Fair Cista, rival of the rosy dawn,
> Called her light choir, and trod the dewy lawn;
> Hailed with rude melody the new-born May,
> As cradled yet in April's lap she lay."

And in a note he says: "The flowers continue expanded but a few hours, falling off about noon or soon after, in hot weather. The courtship between the males and females in these flowers might be easily watched; the males are said to approach and to recede from the females alternately." In this fanciful strain he refers to what we now understand by pollenization.

Again in some of the allies of our species it has been noted, according to Don, and as specially referred to in the lines from Darwin, that they derived the name *Helianthemum* "because they open with the rising of the sun in the morning, and the petals fall off with the setting of the sun in the evening. But they only continue open as long as the sun shines. If the weather is dull, and the sun does not make its appearance, the flowers do not open, but remain unexpanded. Should this continue for several days together, they will decay in the bud." But in American species it has been noted that there are often some flowers which never open or show petals, sun or no sun—and just how the others open under sunshine has not been accurately noted. It is believed that the one we now describe, the Carolina Sun Rock-rose, always has complete flowers. At least Chapman, the most recent author, says so; but Torrey and Gray,

in the "Flora of North America," are not sure of it; and Wood makes no distinction between it and those which have the separate forms of flowers.* Mr. Charles Darwin enumerates many plants which are now known to have two forms of flowers. These apetalous ones are arranged for self-fertilization, while the brighter flowers admit of a possible cross by the pollen of a strange flower; and this he regards as an argument in favor of the advantages of cross-fertilization, as for mere propagation the self-fertilizing forms of flowers would be sufficient. It is remarkable that, although the elder Darwin should refer to the motion of the stamens in *Cistus*, and the two forms of flower are well known to American Botanists, the eminent grandson should have wholly failed to notice the plant in his curious work. It will be well worth the while of the student to watch the behavior of these flowers, and indeed of the whole plant. There are too many who are content to repeat what others have written rather than to observe for themselves, and in this way errors are often perpetuated. Thus in our plant "Citizen Ventenat," who in the (French) year 8 wrote an account of the new plants growing in the garden of "Citizen Cels," tells us it was raised from seeds sent from Charleston, South Carolina, by Bosc, and that it has "fibrous roots;" and this statement has been repeated often since. But the reader will note by our drawing that the roots are rather fleshy than fibrous. With a very little more expansion they would be tuberous.

* As this chapter is going through the press, it may be added, as an ascertained fact, that Wood is correct. This species has sometimes cleistogene flowers.

EXPLANATIONS OF THE PLATE.—1. A complete average sized plant. 2. Nearly mature capsule magnified, and cut across to show the three valves characteristic of the genus.

LOMARIA SPICANT.

L. PRANG & COMPANY, BOSTON.

LOMARIA SPICANT.

NORTHERN HARD-FERN.

NATURAL ORDER, FILICES.

LOMARIA SPICANT, Desveaux.—Rootstock short and thick, very chaffy; fronds tufted, erect; sterile ones nearly sessile or short-stalked, sub-coriaceous, narrowly linear-lanceolate, eight to twenty-four inches long, one to three inches wide, tapering to both ends, pinnatifid to the rachis into very numerous close-set oblong or oblong-linear, often upwardly curved obtuse or apiculate segments, the lower ones gradually diminished to minute auricles; fertile fronds sometimes three feet high, long-stalked, pinnate; the pinnæ somewhat fewer and more distant, longer, and much narrower than the sterile frond, sessile by a suddenly widened base; involucres distinctly intra-marginal. (Eaton in the *Botany of Wheeler's Expedition*. See also Eaton's *Ferns of North America*.)

N some of the older botanical works this fern is described as *Blechnum boreale*, the last name signifying the extreme north, and given in allusion to its high northern range. It is found in the Arctics, and probably grows nearer to the pole than any known fern. In these regions it is called the "Deer-fern," from its forming part of the scanty herbage on which this very useful animal subsists. Another author, whose name is not in mind, tells us that in "Central California, where it is rarely found in deep mountain ravines, it is known as the Jointed Pod-fern;" but the application is not very apparent.

It often happens that a plant will have many common or popular names, or the same name may be applied to many different plants, and it becomes annoying to the botanist to be called to decide what plant may be referred to by them. In the present case, if we may choose one among a large number, it would be Hard-fern or Deer-fern, as being in the best accord with its popular history. Few have had more botanical names than this. Since the time of Linnæus, who called it *Osmunda Spicant*, it has

been named *Onoclea Spicant*, *Asplenium Spicant*, *Acrostichum Spicant*, *Struthiopteris Spicant*, *Blechnum Spicant*, *Spicanta borealis*, *Blechnum boreale*, as well as the one here adopted, *Lomaria Spicant*. The name, *Spicant*, which it has managed to retain through all these changes, is an ancient proper name in use by the old herbalists before botany was remodelled, derived from the Latin, and alluding to the general form of the fronds which is spike-like, as in an ear of wheat—a resemblance which can be traced, though remotely, in the illustration here given. The difficulty in fixing on its proper genus, and which gave rise to so many names, comes from the unity which pervades all nature, and is particularly conspicuous among the ferns. Nothing can be more unlike than the extremes of different genera, but the different species in each genus are often so near alike that it is often a question whether a form is really a species or only a variety of some other; and, as we pass from species to species to the boundaries between genera, it is often as difficult to decide on the genera as the species. Our *Lomaria* is one of these uniting genera, and on this account has given trouble for many years past. Even when describing it as *Osmunda Spicant*, in 1820, Green observes: "It is difficult to decide on the genus of this plant. Dr. Withering and Hedwig determined it to belong to the *Acrostichum;* Dr. Smith refers it to *Blechnum;* and Mr. Robson to the *Pteris* genus; but wherever it may finally be fixed it clearly cannot be an *Osmunda*." Even so late as 1838 botanists, like Sir W. J. Hooker, hesitated what to do with it, for he remarks in his "British Flora," "Mr. Brown suggested that this plant might probably be referred to *Lomaria*, with which indeed it entirely agrees in habit, and other botanists have unhesitatingly placed it there. But if the young fertile fronds be examined, it will be evident that the involucre is by no means *marginal*, for there is a considerable space of frond between it and the margin." In a later work he describes it as *Lomaria;* but adds, "if the very young sori be inspected, the fructification is indicative of *Blechnum*, but the habit and dimorphous fronds are characteristic of *Lomaria*."

It may be remarked here that the difference in size and appearance between the barren fronds and the fertile (see Fig. 2 in our plate)—the dimorphous character referred to by Sir W. J. Hooker—is now regarded as one of the chief characteristics of the genus; for in *Blechnum* all the fronds are alike, those which bear fruit as well as the barren ones. Still there is a difference in the position of the sori and involucre in the mature frond, which is thus described by Prof. Eaton in the work above cited: "Sori in a continuous band next the midrib of the contracted pinnæ of the fertile frond, covered till mature by an elongated involucre, either formed of the recurved or altered margin of the pinnæ, or else sub-marginal and parallel to the margin;" and he adds: "It is closely connected with *Blechnum*, which has the involucre remote from the margin." In order to make this point clear, as described by Prof. Eaton, we have had the enlarged Fig. 3, which shows the fringe-like involucre attached near the edge of the pinnæ, that is to say, "sub-marginal," and which is turned up in the lower edge to show the sori beneath. This illustration also shows the character which suggested the name *Lomaria* to Willdenow, its author, which is derived from *loma*, a Greek word, meaning the fringe or bordering along the edge of a lady's garment.

In our time the study of a fern is not complete without an examination of its veins, for, though their characters are not wholly constant, there is as much stability in them as in most other parts of the structure. Of *Lomaria*, Prof. Eaton says, "veins of the sterile frond oblique to the midrib, simple or forked and free." To aid the student we give in Fig. 4 an illustration of this character. It will be noted in addition to the obliquity of the veins to the midrib, the secondary, or upper forking, is rather more curved at the base or cup-like than the lower ones.

Lomaria Spicant is regarded as a very variable fern, but the variations are chiefly in its size. In California and Oregon the fronds are often two feet long; while the Alaska specimens of Prof. Rothrock are like that illustrated in our plate, and which is

a fair average size. Sir W. J. Hooker notes a peculiar variation found in "Derbyshire, England, by Mr. Henry Robson, which is proliferous at the end, with numerous repeatedly dichotomous branches." These peculiar, and we may perhaps say individual variations, are much prized by florists.

This species not only inhabits high northern regions, but goes almost round the world—a form being even found in Japan.

EXPLANATIONS OF THE PLATE.—1. An average-sized plant complete. 2. A fertile frond. 3. Enlarged pinnule, showing the involucre and sori or fruit. 4. Male pinnule, showing the venation.

SAMBUCUS PUBENS.

L. PRANG & COMPANY, BOSTON.

SAMBUCUS PUBENS.

RED-BERRIED ELDER.

NATURAL ORDER, CAPRIFOLIACEÆ.

SAMBUCUS PUBENS, Michaux.—Stems woody, two to eighteen feet high, the bark warty; leaflets five to seven, ovate lanceolate, downy underneath; cymes panicled; fruit bright red, rarely white. (Gray's *Manual of the Botany of the Northern United States.* See also Chapman's *Flora of the Southern United States,* and Wood's *Class-Book of Botany.*)

IT is remarkable that the woody plants of our country and the woody plants of Europe often have a particularly close relationship. Thus the American sweet Chestnut, the American white Birch, and others, have representatives in Europe so closely allied that some botanists hardly regard them as distinct species. Our Red-berried Elder is a good illustration of this. There is a red-berried Elder in some of the mountains of Europe long known as *Sambucus racemosa;* and though Michaux regarded our plant as distinct, and therefore gave it the name of *Sambucus pubens*, the botanists of our time seem disposed to regard it at best but a mere variety, and so write of it as *Sambucus racemosa*, variety *pubens.* The older name, *racemosa*, was suggested by the inflorescence being drawn out instead of forming a flat umbrella-like head, as in the common elder; and in like manner *pubens* is from the fact that the American Red-berried Elder which Michaux had, was more downy in the leaves than the Red-berried form in Europe. But in some parts of our country forms are found as smooth as the European, so that this distinction, as it struck Michaux, is of little moment. But there are other characters which seem to separate the plants of the two countries constantly, as may be

observed when they are growing side by side. The inflorescence is less racemose in ours, that is to say the bunch of flowers is less drawn out; the flowers individually have a pinkish tinge in their early stage, becoming pure white only on complete expansion; and the berries are smaller than the European; while the bark has a rough, warty character, apparently wholly wanting in the European form. How far these characters may lay claim to the distinction of being specific depends on the views of different botanists, some giving plants distinctive botanical names on more slender distinctions than others, so that what one would regard as a mere variety another would class as a distinct species.

Sambucus, as applied to the Elder, is a very old name, being found in the works on Natural History of Pliny the Elder, whose curiosity as a student of nature led to his death by an eruption of the volcano of Mount Vesuvius, seventy-nine years after the birth of Christ. It is not quite clear why the plant was called *Sambucus*. The Greeks had a stringed instrument called *Sambuka*, the exact construction of which is unknown in these days; and, from the similarity in the names, it is supposed that the wood of the Elder was used in the construction of the instrument. The wood is very hard and bone-like. It has a very large pith, which, when removed, makes the hollow tube sought for by boys who delight in "pop-guns." Butchers use the wood for skewers, and the pith has its use in the toy-making art.

Many singular stories cluster about the different kinds of Elder trees. Though the popular mind has settled on a leguminous tree—*Cercis*—as the "Judas tree," some ancient authors regarded the Elder tree as the one on which the remorse-stricken apostle hung himself; and this probably is the foundation of many superstitions which have existed among the people of Europe up to a very recent date. A dwarf form in England is known as "Dane-wort," from its being supposed to have sprung from the blood of Danes. Wherever they fought and bled, the dwarf Elder is supposed to have sprung up and

marked the spot. On the battle-field in Worcestershire, in England, where the first conflict occurred between the Royalists and the Parliament, under Cromwell, there is a large quantity which the popular mind supposes to have sprung from the blood shed on that occasion.

The berries of the common black Elder are believed to be poisonous to birds and poultry. It is at least singular that they seldom seem to touch them, while those of our Red-berried species are eagerly sought for and greedily devoured. On the cultivated plants, from which our drawing was made, they were all eaten one year, before quite colored; and the next season, the bunch which our artist had before him was only secured by having a gauze net placed over it.

In our country it grows only on mountains or in high elevations, and it is so essential a part of the scenery that it is soon missed when absent. Pursh, in his Journal of a tour through the Northern States, struck by its absence in the Pokono, quaintly remarks: "Though the country being so very high, I did not observe the *Sambucus pubens* common to such places." In its greatest beauty the writer of this has seen it as, in the language of Whittier, he

> "Looked down the Apalachian peak
> On Juniata's silver streak"

beyond the Susquehanna in the mountains of Pennsylvania, where in June it is in full fruit, when the common American Elder is coming into flower; and there the berries remain on for a month or more, till, in the words of the same poet,

> "—— autumn's rainbow-tinted banner
> Hangs lightly o'er the Susquehanna;"

the birds perhaps having enough and to spare. In the Rocky Mountains, along Clear-creek Canon,

> "Where the spray of the cataract sparkles on high,
> . . . . . .
> Hurrying down to its grave, the sea,

> And slow through the rock its pathway hewing!
> Far down through the mist of the falling river,
> Which rises up like an incense ever,
> The splintered points of the crags are seen,
> With water howling and vexed between,
> While the scooping whirl of the pool beneath
> Seems an open throat, with its granite teeth"—

in just such a piece of scenery as this from Whittier's description of the Merrimac, the writer once saw it in surpassing beauty. It was from this spot that the seeds were obtained which furnished plants for the illustration here given. The berries are scarcely as large as when growing in its Rocky Mountain home, or perhaps as generally seen in high mountain ranges. It is usually found in the high mountainous ranges of the continent. Mr. Hall found it in Oregon, though rather rare, and, as he says, only in "thickets about the lower cascades," indicating here also the spray-loving habit already noted in connection with its Rocky Mountain home. In Utah Mr. Watson found it in the Wahsatch Mountains at elevations of from six to nine thousand feet. Brewer and Watson, in the Botany of the Californian Geological Survey, note it as being found in the mountain woods of that State, extending northwardly even to Alaska. In the Atlantic States it extends southwardly along the Alleghenies to North Carolina, which seems about the most southern point it has reached in the eastern part of our territory; as Oakland, California, seems to be in the west.

EXPLANATIONS OF THE PLATE.—1. Warty branch of last year. 2. Branch with unexpanded flower buds. 3. The same in fruit. 4. Expanded flower slightly magnified, giving a full-face view. 5. Side view of the same, showing the insertion of the anthers, and recurved petals.

APHYLLON UNIFLORUM.

L. PRANG & COMPANY, BOSTON.

APHYLLON UNIFLORUM.

ONE-FLOWERED BROOM-RAPE.

NATURAL ORDER, OROBANCHACEÆ.

APHYLLON UNIFLORUM, Gray.—Scaly stem short and nearly subterranean, bearing few scapes a span high: calyx-lobes mostly much longer than the tube, subulate, usually attenuate: corolla violet-tinged, and flower violet-scented, an inch long: the lobes obovate and rather large. (Gray's *Synoptical Flora of North America.* See also Gray's *Manual of the Botany of the Northern United States*, Chapman's *Flora of the Southern United States*, and Wood's *Class-Book of Botany.*)

THE mere lover of wild flowers will not call this one beautiful, though he rarely misses a chance to gather it, and to bring it home as among the singular illustrations of the curiosities of flora. And yet it is pretty, and especially so is a small bunch of them, and they possess the additional charm of a delicate agreeable fragrance. But even the most indifferent to botany as a science will not rest satisfied with knowing that he has found a mere curiosity. The plant appears to be nothing but flowers and slender flower stalks; and, even when the earth about these stalks is cleared away, it exhibits nothing but a little scaly stem attached to the roots of some other plant. Even those who are usually indifferent to botany as a science will inquire into the purposes of such an organism, and take an interest in the many questions connected with its behavior which attract the scientific man as well. In our picture the little mass of scales (Fig. 1), about an inch long, comprises all that might properly be called the plant, and this is wholly under ground. It has attached itself to a piece of oak root (Fig. 2), and in this way derives its sole support. But it does not confine itself to the oak. In Pennsylvania the writer has found it also on the beech, although this tree has one species of parasite, the Beech-drops,

or *Epiphegus Virginiana*, which seems to confine itself especially to that tree. But this one is a sort of general lover. While in the North attaching itself seemingly to the roots of any deciduous tree, in the South it is reported as growing in pine woods; and the inference is that the roots of the pine afford it sustenance in such cases. De Candolle, in his "Prodromus," notes that it has been found on composite herbaceous plants, especially on the Golden Rod, or *Solidago;* and it is probable that it has no choice, but will attach itself to anything that comes first. This fact is of itself a particularly interesting one, for it has been suggested that those parasites which have green leaves, like the mistletoe for instance, feed only on the crude sap, which by the aid of their green leaves they elaborate to suit the special wants of their own organisms. On the other hand, the colorless parasites are supposed to feed on the sap already elaborated by the parent plant, not having any green leaves of their own, through which, as the student knows, the food of plants is usually prepared. If this be so, our *Aphyllon*, feeding on so many varied kinds of plants, should present varied chemical combinations. It is hardly probable that any great difference will be found, but the suggestion may serve to show in what direction original discoveries may yet be made. Again, we know that in scaly bulbous plants, as in the lily, the scales are imperfectly developed leaves; and that as the plant grows, perfect leaf-blades appear. We may therefore from analogy look on the scales of our present plant as being imperfectly developed leaves; and yet no one has ever known leaves to be perfectly produced. It is not probable that these scales are of any more use to the plant in its present condition than though the stem was perfectly round, and all trace of scales absent; and it is such facts as these which are often employed in aid of the doctrine of evolution. It would be contended that this plant was not always leafless as now,—that at some time in the long past it had perfect leaves, but assuming a parasitic character, and finding itself in a condition to do without leaves, failed to produce them perfectly any longer. This view

might receive additional strength in the case of this *Aphyllon*, for it is not probable that the ancestors of any modern parasitic plant had originally parasitic habits. A tree or foster-plant must be formed first before a parasite has anything to live on, even in the strictest sense in which we may view the order of creation; and with the modern geological views of time there is no difficulty in believing that parasites came into existence long after the plants on which they feed.

The absence of leaves on the parts seen above ground suggested its botanical name *Aphyllon*, which is Greek literally for "without leaves." The earliest authors thought it a true Broom-rape, or *Orobanche;* but Dr. John Mitchell, an early botanist of Virginia, sent, in 1740, to Peter Collinson, of London, a paper in which he proposed to make thirty new genera of Virginia plants, and he proposed to divide this from *Orobanche*, and make it a separate genus as *Aphyllon*. It does not seem to have been approved by his contemporaries, for Gronovius, in his second edition of "Flora Virginica," published in 1762, makes "*Aphyllon* of Mitchell" but a synonym of his "Orobanche caule unifloro," the practice of having a single specific name as well as a generic one not having then been adopted. In time the difference from *Orobanche* was recognized, and it came to be known as *Phelypæa*, *Gymnocaulis*, *Anoplon*, and *Anoplanthus*, under which with *Orobanche* it will yet have to be traced in European works; but American botanists of the present day are properly ruled by the law of priority, and this decided Dr. Gray to go back to the oldest name, which is *Aphyllon* of Dr. Mitchell.

The manner in which our *Aphyllon* is distributed is among the very interesting facts connected with its history. Usually the species of parasitic plants are not remarkable for being widely scattered, but this is found over a vast extent of territory. Clayton, in his notes of the Flora of Virginia, published by Gronovius, pronounced it "very rare," and perhaps few botanists ever observed it covering any large space in any one location, and yet there is scarcely a collector in any part of the United

States who has probably not met with it at some time or another. It flowers in June, and is found in the extreme north of our territory down to Florida, Louisiana, and Texas, as well as all along the States on the Pacific coast. Mr. Sereno Watson collected it in the Wahsatch Mountains in Utah at an elevation of 7,000 feet. It is not yet positively known whether it is an annual or a perennial.

EXPLANATIONS OF THE PLATE.—1. The scaly root-stock or stem. 2. Root of an oak supporting the parasite. 3. Flower with the corolla divided lengthwise, to show the arrangement of the stamens and pistils.

CALTHA PALUSTRIS.

L. PRANG & COMPANY, BOSTON.

CALTHA PALUSTRIS.

MARSH-MARIGOLD.

NATURAL ORDER, RANUNCULACEÆ.

CALTHA PALUSTRIS, Linnæus.—Leaves reniform or orbicular, crenate or entire; two to four inches wide, on long semi-cylindric petioles, upper ones sessile, all of a dark, shining green, veiny and smooth. Root large, and branching. Stem about two feet high, sometimes trailing, hollow, round, dichotomous. Flowers of a golden yellow in all their parts, one and a half inch in diameter, few, pedunculate. (*Wood's Class-Book of Botany.* See also Gray's *Manual of the Botany of the Northern United States*, and Chapman's *Flora of the Southern United States.*)

IN almost all countries the advent of spring is hailed with delight. Poets love to picture its coming.

"'Tis springtime on the eastern hills!
Like torrents gush the summer rills,
Through winter's moss and dry, dead leaves
The bladed grass revives and lives,
Pushes the mouldering waste away,
And glimpses to the April day.
In kindly shower and sunshine bud
The branches of the dull grey wood;
Out from its sunned and sheltered nooks
The blue eye of the violet looks;
The southwest wind is warmly blowing,
And odors from the springing grass,
The pine tree and the sassafras,
Are with it on its errands going.

If we in this country where the winters are by no means long or monotonous can sympathize with these lines of Whittier, how must the Laplanders rejoice when they see their first spring flower! In these far away places spring is not supposed to come till the cuckoo's voice is heard; and Linnæus thought it important enough to note that the first flowers of the marsh-marigold

opened simultaneously with the first appearance of this early bird in that land. In our country we show our thankfulness for spring in our spring-flower parties, to which violets and trailing Arbutus chiefly pay tribute; but in the older lands, where spring does not come so soon, and is more important, they have formal May-day festivals, and the "marsh-marigolds" enter largely into the wreaths and garlands employed on these joyful occasions. Some have supposed from its name, marigold, that it may have at some time been dedicated to the Virgin Mary; but this suggestion shows how easy it is to be mistaken by similarities, for it appears by Prior's researches that marigold is simply the *merse mear-geallia* of the old Saxon language, and which simply means "marsh-horse gold," and the earlier poets called it simply "gold-flower" or "marsh gold-flower."

The name adopted for its botanical one is of very ancient origin, as it occurs in Vitruvius, Pliny, and other ancient Latin authors; but there seems to be an uncertainty as to what plant was referred to. Pliny is believed to have had in mind a sort of white violet when he uses the name. Some have thought some species of Calendula—the common "pot-marigold"—might be referred to, and of which one species, *Calendula arvensis*, is found in Greece, growing on rocky hills; but the old fable connected with it seems to have an eye to some swamp or fountain-loving plant, for the story goes that there was once a Sicilian boy named Clymenon, a grandson of Patura, who was in love with the Sun. Whenever night came he was so disconsolate that he could hardly sleep, and he always rose betimes so as to get the earliest glimpse of the object of his devotion. So passionate became this sun-worship, that he would on no account pass a moment in the shade. But once the sun remained under a cloud for eight days. Clymenon sought by the aid of a fountain to see some reflection of his beloved sun, but failing pined away, and died! When at the end of its cloudy period the sun shone out, it discovered the body of its true love. It pitied Clymenon, and turned the body into a beautiful flower on the spot where he

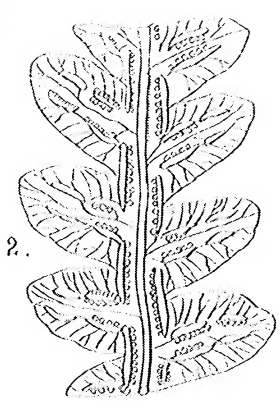
fell; and where in this floral form, Atys, Cybele's favorite shepherd, found him while sitting near the fountain some time afterwards.

In our country, to which it is indigenous as well as to so many portions of the old world, it has not attracted any marked attention, though Bigelow says bunches of them are brought among the early wild flowers, and sold on the streets of Boston as "cowslips." A distinguished English author, noticing this statement, is indignant that the name of the true poetical cowslip—or *Primula*—should thus be trenched upon; but there is little danger of our Shakespearian friend suffering long by this local trespass of the citizens of Boston, for "marsh-marigold" is becoming popular everywhere. In some parts of England they go under the name of "May-Blobs." It is said that the early spring leaves make good greens when cooked, and that the thick root-stocks yield a good starch which is wholesome when boiled, but the raw leaves are very acrid. No cattle will touch them, and as they are closely related to the Hellebores, may well partake of the dangerous properties of that section of Ranunculaceous plants. The buds have a particularly biting character, and it is said have been used as a substitute for capers.

The earlier botanists, in their description of Caltha, spoke of it as having "calyx none," in distinction with Ranunculus, its ally, which has a calyx. They regarded the colored parts as "petals" only. Modern botanists say "petals none," as they prefer to regard them as sepals, and a true calyx. If they were writing of lilies they would call these floral envelopes merely a perianth, for really these floral parts are as much calyx as corolla, or rather both combined. The number of these parts varies from four to ten, and judging from Ranunculus we may very well believe that when the highest of these numbers is reached, five stand for sepals, and five for petals, as in the true crow-foots. In the whole of the *Ranunculaceæ* the stamens very readily revert to petals, as in their earlier stages they are believed to be the same.

In our country the marsh-marigold extends down to South Carolina, where, according to Chapman, it is found in cedar-swamps; on the Pacific shore, however, it is not found in California. It becomes rather abundant as it leaves South Carolina on its northward journey, and from the north extends across the continent to Asia, being one of those plants which makes a circuit of the globe. As usual in widely distributed species it exhibits some variations at times, and though in such cases it is usual to say that the variations are brought about by "climate" or "location," it is by no means clear that this is the case, or indeed that any one has yet discovered what is the law that induces these variations. In some instances they are found with the leaves toothed or notch-edged, as in our plate; at other times plants are observed with the edges quite entire. Then cases occur where the leaves are on long petioles, and again where they are sessile, that is to say without leaf-stalks. Sometimes the stems are quite upright, and at others they have been found trailing over the mud, and then they differ, as already noted, in the number of the floral envelopes. In past times when the range and the limit of good species were not known as now, many of these forms were regarded as good species, and had distinctive appellations. Mr. Sereno Watson, in his Bibliographical Index, gives the names of nine so-called species which are all regarded now as the same as *Caltha palustris*, and are classed as synonyms,—Mr. Watson supposing that perhaps one Siberian form may be worth retaining as a distinctly marked variety. Sometimes all the stamens revert to petals, and then we have of course a double flower, in which condition it is much prized by cultivators who may have a rather damp piece of ground to grow it in. In Mr. Darwin's "Forms of Flowers" he notes a case on the authority of a French author, Lecoq, where pistils and all had turned to petals, making a complete male flower, and that the plants which bore these were mingled with plants having the normal hermaphrodite flowers. Mr. Darwin regards this as remarkable from his point of view.

1.



2.

WOODWARDIA VIRGINICA.

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WOODWARDIA VIRGINICA.

COMMON CHAIN-FERN.

NATURAL ORDER, FILICES.

WOODWARDIA VIRGINICA, Willdenow.—Fertile and sterile fronds alike, ovate, smooth, pinnate; pinnæ lanceolate, narrowed at both ends, pinnatifid; segments oblong, obtuse; veins forked, forming a single series of areoles along the midrib both of the pinnæ and of the segments; areoles fruit-bearing in the fertile frond. Root-stocks as thick as one's finger, creeping, elongated, with a rough black exterior, the interior soft and white. (Chapman's *Flora of the Southern United States.* See also Gray's *Manual of the Botany of the Northern United States*, and Wood's *Class-Book of Botany.*)

THE genus *Woodwardia* is not wholly American. It has a few representatives in Japan, India, New Holland, and a few other places. Still some of its most interesting forms are found in the territory covered by our work. The person after whom the genus was named, Thomas Jenkinson Woodward, does not appear to have had any connection with the history of the genus, but was a botanist well versed in the study of British plants, paying especial attention to the sea-weeds, on which he furnished some valuable papers to the Linnæan Society, of which he was a member. The plants now comprising our genus were known to Linnæus as *Blechnum.* Sir James Edward Smith, President of the Linnæan Society, distinguished them from that old genus, and named the new one for his friend, Mr. Woodward. The genus is regarded as a very good one by the leading botanists, and is characterized—in the language of Mr. Thomas Moore, the author of a leading work on Ferns—"by the remarkable indusiate linear-oblong or sub-lunate sori, placed near the costa, the receptacles being formed of transversely arcuate anastomosing veins, which form one or more series of elongated costal areoles." That the reader may understand this

more clearly, the enlarged study, Fig. 2, is given. In further explanation it may be noted that the veins in ferns often run parallel with each other, or nearly so; but in other cases they form a sort of net-work, or, as it is said botanically, they anastomose. In the case of these ferns this net-work is confined to the parts of the frond, bordering on the costa or midrib of the pinnule and its divisions, the outside portions having the veins free, that is to say, not connecting with each other. The spaces bounded by the small connecting veins are called the areoles. In our species, referring again to Fig. 2, we see that there is but one series of these areoles, and which in our specimen bear the fruit dots. There are other species of *Woodwardia* which have several rows of these areoles, and those botanists who regard the venation or arrangement of veins as of great structural importance, divide the genus into two, and then make *Woodwardia* a mere synonym. The set with several rows they call *Lorinseria;* and the other, which contains only our present species, is called *Anchistea*, of Presl, who, in 1849, wrote a work on Ferns, in which he made the venation the chief foundation of his system of arrangement. The name *Anchistea* is from the Greek, signifying related to, and suggested by the fact of its standing closely between other genera in the estimation of the author. A large number of American botanists do not place the same generic value on these conditions of the veins, and so retain *Woodwardia* for all of them; but it must be confessed that, besides the veining, the general appearance, which so often is made to do duty in defining genera in other cases, exists very strongly here. Our common chain-fern has the fronds all alike; other species of the genus have them different; and yet *Lomaria* taken from *Blechnum* depends quite as much for its distinction on the difference between the barren and fertile fronds as on any other character. These facts may show the student how careful the critical study of ferns must be.

The rhizomes, or creeping underground stems of ferns—indeed, the whole root system—has of late years been found to

afford a good study. There was not room to show the root of this species on our plate, but it is much coarser and thicker than the species with which it often grows, and may be readily distinguished by this alone. Mr. Robinson, in his interesting little work—"Ferns in their Homes and Ours"—uses the *Woodwardia* to illustrate the great value of the root study. He observes: "To connect *Woodwardia Virginica* with the extreme form of *Pteris*, it will be only necessary to suppose the loose crown of the *Woodwardia* so elongated that only one frond will be found to every inch of stem, and the terminal point of growth to keep at a given distance below the surface of the ground." There is nothing more instructive than such comparisons as these between one species or genus and another.

The name of *Virginica* is derived from one of the adjectives given before the binomial system came into vogue, as so many modern specific names are. It occurs with a figure in the work of Plukenet, an old author, and it is by the aid of this figure that the plant described by Michaux as *Woodwardia Banisteriana* is known to be the same, for his statement that he found it "in the mountains of North Carolina" could scarcely apply to this species, for no one has found it there, or in any mountain region, as it is wholly a lowland plant, seldom being found at elevations much above the level of the sea. Nuttall found it in Arkansas, and it works up into Ohio and to Michigan, and from thence is found eastwardly to Liverpool in Nova Scotia. Its favorite home is along the Atlantic sea-board States, extending down to Florida and Mississippi. A fern very much like it appears in Japan, but is regarded as on the whole distinct from our species. It varies somewhat even in our own land, and one marked variety was thought to be a species by Pursh, and named *Woodwardia Thelypteroides*.

In the wet and bushy swamps of New Jersey, the common Chain-Fern has often an important part in giving character to the scenery. It thrives among alders, *Magnolia glauca*, Andromedas, and other Ericaceous plants; with sedges, swamp grasses,

and other moisture-loving things. In such situations, the fronds are often two or three feet in length; and, only that it does not make as dense a growth, gives the groups of vegetation much such a character as does the common brake of Europe. It seems to have been one of the earliest of American ferns to become cultivated in English gardens, as there are accounts of it being a favorite in 1724, and it is yet quite popular. A writer in Shirley Hibberd's *Gardener's Magazine*, so recently as the volume for 1879, speaks of it as one of the noblest-looking of ferns popular in English gardens, and recommends the giving of it a place in the fern garden where its magnificent proportions may be shown to the best advantage. Though naturally growing in wet places it thrives very well in any common garden ground, if the earth be not exposed to the hot sun; and when our native ferns are as much appreciated in their own country as they are in the old world, this will be one of the most popular of all.

EXPLANATION OF THE PLATE.—1. A rather small frond from Mr. W. F. Bassett, of Hammonton, New Jersey. 2. Enlarged portion of a pinnule showing the venation and fruit.

GILIA TRICOLOR.

L. PRANG & COMPANY, BOSTON.

GILIA TRICOLOR.

TRI-COLORED GILIA.

NATURAL ORDER, POLEMONIACEÆ.

GILIA TRICOLOR, Bentham.—A span to a foot or two high, mostly slender, paniculately branched, at length diffuse: leaves mostly twice pinnately parted into narrow linear lobes, and, with the calyx viscid pubescent: flowers few or several and short-petioled or subsessile in cymulose rather short-peduncled clusters: corolla (half an inch long) twice or thrice the length of the calyx, with very short and yellowish proper tube, ample campanulate-funnelform throat marked with deep brown purple, and lilac or violet roundish lobes which surpass the stamens. (Gray's Synoptical *Flora of North America*. See also Volney Rattan's *Flora of California*.)

THE gardening of the olden time was rich in perennial plants. What are now called annuals were comparatively unknown in that age. Indeed, their popularity as constituting a chief class of garden flowers dates from little over fifty years ago. Attention was chiefly drawn to their varied beauty from the many species, found growing on the western shores of our own land; and in attracting this attention the plant we now illustrate had an important part. In the early part of the present century the Royal Horticultural Society of London was a very able and influential body. Some of the most intelligent horticulturists and botanists controlled its movements. At the time we have in mind Mr. Sabine, in whose honor *Pinus Sabiniana* is named, was Secretary; and the society decided to send a special collector to America in search of plants. Chiefly on the recommendation of Sir W. J. Hooker, David Douglas, the son of a stone mason, born at Scone, in Scotland, in 1798, and who had shown remarkable aptitude in the study of different branches of natural history as well as gardening, was selected for the journey, and he left England in 1823. He did not return till four

years thereafter. During that time he suffered numerous perils and hardships; but being known to the Indians as "the Big Grass-man," he generally managed to retain their good will. Afterwards he came again to this country, taking chiefly the southern portion of the north Pacific coast. He made a trip to the Sandwich Islands. The natives there, as in Canada and other places, ensnare wild beasts by digging deep pits, covering them lightly so as to elude the animal's observation, and it then falls through and cannot get out. Douglas fell into one of these, which already had entrapped a wild bull, and he was there gored to death on the 12th of July, 1834. Thus died one of the most diligent and successful explorers and collectors of American plants, and one to whom our gardens are indebted perhaps more than to any other man. It was to his labors especially our first knowledge is due of the plant we now illustrate—*Gilia tricolor*. It is remarkable how rapidly we have gained knowledge of this beautiful genus of plants. At the present time there are about seventy species, almost all natives of the United States. Yet it is only since 1794 that the first one has been known, and that one, *Gilia laciniata*, was then described in a work on the Flora of Peru and Chili, published in Madrid by two botanists, Hipolite Ruiz and Jose Pavon, who named the genus, according to Dr. Gray, after "Philip Gil, who helped Xaurez to write a treatise on exotic plants cultivated at Rome." It would have been more pleasant if such a beautiful and exclusively American genus could have commemorated some one connected with American botany, but it is the fortune of scientific discovery and of scientific laws of nomenclature to sometimes work this way. The order to which *Gilia* belongs, *Polemoniaceæ*, has numerous representatives in the United States, and especially in that part included between the Rocky mountains and the Pacific ocean. Douglas, during his explorations, found no less than twenty-five new species belonging to this order, and new ones are being continually found. Several species of Gilia have been recently described by Dr. Gray and Mr. Sereno Watson. But although

the order is so numerous, it is divided into but few genera. Dr. Gray, in his "Synoptical Flora of North America," recognizes only five—*Phlox*, *Collomia*, *Loeselia*, *Gilia* and *Polemonium*. So that if the student is sure he has a Polemoniaceous plant, it will not be difficult to find out the genus to which any species in question may belong. Dr. Gray divides the order into two great divisions—those which have the stamens unequally inserted on the tube of the corolla, placing the two first named in that division, and those which have the stamens equally inserted in or below the throat, and which contains the three last, among which *Gilia* is found. The student is not likely to confuse *Loeselia* with *Gilia*, as there are only two of them, and Dr. Gray notes that in *Loeselia* the "filaments are declined," while in *Gilia* they are "not declined," and the "Botany of California" says of Loeselia: "Flowers nearly as in *Gilia*, section *Ipomopsis*, except that the tubular-funnelform corolla is irregular, as it were bi-labiate, one of the cuneate or oblong lobes being separated by deep sinuses." Of *Polemonium* Dr. Gray enumerates only eight species as natives to the whole of the United States; so we see that *Gilia* is much the most important genus in the order. From *Polemonium* the stamens afford the readiest means of distinguishing it, for while the genus named has the stamens more or less declined as in *Loeselia*, in *Gilia* they are never so. This does not seem much to found a generic character on, nor is it the sole one, but merely the most decided difference; but it is one of those cases where nature is in advance of descriptive science, for few would take a *Polemonium* for a *Gilia*, or this for the other, after an acquaintance with a few species generally referred to them. The whole genus *Gilia* is an extremely difficult one to define, and therefore will be very welcome to those students who love to trace close relationships, and which indeed is becoming one of the most interesting of botanical pursuits. Many of the best Botanists have tried their skill in endeavoring to break the genus into distinct genera. Thus we have *Dactylophyllum*, *Linanthus*, *Leptosiphon*, *Siphonella*, *Leptodactylon*, *Navarretia*,

Hugelia, *Elaphocera*, *Ipomopsis*, *Giliandra*, *Microgilia* and *Eugilia;* but which Dr. Gray now regards as not materially differing from *Gilia*, and which he retains merely as names of the several groups of the genus. It would be hardly worth retaining them at all, burdening the memory as their retention does with a host of useless names, only that they are often yet met with as generic ones in many places, and their record in a work like Dr. Gray's helps the investigator in finding out what is meant. Our *Gilia tricolor* would have to be sought for in *Eugilia*, or that section which might be regarded as the "best" *Gilia*—those the nearest to the original type.

We have not met with any account of its general effect on the landscape; but if it gets the chance to grow in masses, as we can have it in gardens, it must be among the leading floral adornments of its wild native home. Dr. Gray merely says that it grows "in California throughout the western part of the State." The "Botany of California" notes that it "is common in the western part of the State and in the foot-hills."

In gardens the seed is sown in the early part of March, or as soon after the frost disappears as possible, for if left till the weather becomes warm, it flowers before it gets much strength, and soon exhausts itself. The early sown plants, if not permitted to bear seeds freely,—that is to say, if the shoots with flowers be cut off as they fade,—will continue in bloom most of the summer, unless the spot be very hot and dry. It is an excellent plant to flower in pots during the winter. For this purpose the seed should be sown in August or September, according as the place where it is to grow be warm or not. It does not, however, like to be forced much. It grows well with very little heat, and dislikes more than it needs for steady growth.

MONARDA DIDYMA.

L. PRANG & COMPANY, BOSTON.

MONARDA DIDYMA.

OSWEGO TEA.

NATURAL ORDER, LABIATÆ.

MONARDA DIDYMA, Linnæus.—Somewhat hairy, two feet high; leaves petioled, pointed; the floral ones and the large outer bracts tinged with red; calyx smooth, incurved, nearly naked in the throat; corolla smooth, two inches long, bright red, showy. (Gray's *Manual of the Botany of the Northern United States.* See also Chapman's *Flora of the Southern United States*, and Wood's *Class-Book of Botany.*)

THE genus *Monarda* is especially well qualified to be called a representative of the flora of the United States, as most of the species belonging to it are found here, while the very few other species which are known besides grow in Mexico. With the exception of the genus *Blephilia*, *Monarda* has no very close allies, the nearest perhaps, after *Blephilia*, being the Rosemary of Europe; but even this is so different in general appearance that, aside from acute structural botanists, few persons would suspect the affinity. Its nearest relatives in the flora of our country (always after *Blephilia*) are the Sages and Catmints; these, however, are also quite unlike *Monarda*, so that even beginners in botany will not be very apt to confound them. In general habit *Monarda* might perhaps be mistaken for *Pycnanthemum*, or Mountain-Mint, a genus of the same natural order; but a very little knowledge of the difference in the structure of the two genera will suffice to guard the student against this error. To the casual observer the flowers of our genus will bear a very strong resemblance to those of some of the scarlet-flowered Sages. In the *Salvia*, or Sage, however, the stigma is cleft into two unequal and prominent segments, while in *Mo-*

narda the divisions are minute and nearly equal. (See Fig. 3.) Passing over other minor characteristics, we will only add that the anthers also offer a very good distinguishing mark. In *Salvia* the twin anther-cells are attached to separate divisions of the filament; and while one of them is perfect and projects forward, the other is imperfect and extends backward, both stamens forming lever-like appendages, which to some degree obstruct the passage of insects in search of the sweets in which these flowers abound. In *Monarda*, on the contrary, the anther-cells are widely divergent at the base, but are joined together at the apex.

Morphologically considered, the genus *Monarda* is a welcome one to the student, as it shows better than many others the intimate relations between the different portions of a plant, from the leaf to the final fruiting condition. It is very well known that primarily all the parts of the flower are leaves; or, correctly speaking, what might have been leaves under certain conditions, become instead calyx, corolla, or some other parts of the flower. In the change from the leafy to the floral condition, the growth waves are usually uniform in each species. At flowering, these growth-waves operate very strongly in a spiral direction, giving great force to the development of what might have been an axillary bud, but which now becomes a flower, and wholly suppresses the elongating portion—the main axis or stem. In a sunflower, for instance, we have all the growth resulting in the formation of a broad flat mass of little florets, and this circular growth is always the same in all sun-flowers. In our *Monarda* we have the same total suppression of this elongation of the main stem in the heads of flowers, terminating the branchlets in Fig. 1; but in Fig. 2 the axis pushed on after waiting a little to permit of the lower head of flowers being formed and then started on again, ending in two more waves. Thus we have a branch with three small heads, resulting from three distinct rhythmic growths in Fig. 2 against the single wave in Fig. 1. The theoretical lesson from this is, that in this species the rhyth-

mic waves follow each other in rapid succession, without the interval of time that usually takes place between them. In other plants, where more decided lines are drawn between these successive wave-growths, there is little resemblance between a leaf and a calyx, or calyx or corolla; but in *Monarda didyma* we see how gradually the slightly petioled leaves become sessile, then how gradually the leaves turn to bracts, as seen in the heads of Fig. 1, and even these are colored as the corollas are. We may thus learn from these studies that decision and indecision in growth-waves have much to do with the ultimate character of a plant.

The genus to which our plant belongs was named *Monarda* in honor of Nicolas Monardes, a Spanish botanist, born at Seville, who died in 1578. So many of the early known American plants, which were necessarily first examined by Europeans, were named for persons in no way connected with the history of anything American, that it is quite a pleasure to meet with an instance in which the case is different. Monardes, we are told, was not only a good botanist, but, in the language of Dr. Gray, he was also the "author of many tracts upon medicinal and other useful plants, especially those of the New World." One of these treatises was on the citron, orange, etc., and was published in 1564. Our plant has had several synonyms, of which *Monarda purpurea* is probably the best known. Its common name is Oswego Tea, and here and there it is also called Bee-Balm. According to Barton, the first of these two names was given to the plant because the Indians, who call it O-gee-che, "Fiery or Flaming Flower," make tea of the *flowers*. We may mention, in this connection, that an old English writer says the Oswego Tea is "not only a very ornamental plant in gardens, but the scent of the leaves is very refreshing and agreeable to most people, and some are very fond of the tea made with the young *leaves*."

The introduction of our plant into England is probably due to John Bartram, who called it *Monarda Oswegoensis*. In a letter

to him, dated London, June 2d, 1747, Dr. John Mitchell mentions the fact that Peter Collinson had sent to Bartram for a number of American species, and among these was the Oswego Tea. The plant was no doubt sent in obedience to this reminder, for we find it recorded in Aiton's "Hortus Kewensis" as introduced "before 1752 by Peter Collinson, Esquire." It has always been very highly appreciated by garden cultivators, as it well deserves to be,—not only on account of its gay and brilliant color, but also because it produces a succession of flowers in the autumn, lasting nearly a month. Mr. Robinson, of London, in his work on "Hardy Flowers," speaks of it as a valuable plant to allow to run wild and take care of itself in the woods, when making a "wild garden." For this purpose it is exceedingly well adapted, as it increases rapidly by sending out thready under-ground runners, from which young plants shoot up; and as it is not difficult to keep when once thoroughly established. In its native places it seems to prefer low moist ground, but it does very well in any common garden soil.

Monarda didyma is the most northern species of its genus, being found in Maine. As it progresses south, it seems to leave the seaboard, for it is not common in eastern New York, and in New Jersey occurs only in the northwestern counties. It extends down the mountains to Virginia, and Dr. Chapman says that it reaches North Carolina. According to Prof. Wood, however, its range from north to south would seem to be even more extensive, as he locates it from "Canada to the mountains of Georgia." In the west, it appears in southern Michigan, but is rare in Ohio. It is occasionally found in Indiana, but is believed not to be indigenous there. Its true home seems to be along the Alleghany Mountains.

EXPLANATIONS OF THE PLATE.—1. Branchlet with a single head. 2. Branchlet with proliferous head. 3. Individual flower in outline.

COTYLEDON NEVADENSIS.

L. PRANG & COMPANY, BOSTON.

COTYLEDON NEVADENSIS.

NEVADA COTYLEDON.

NATURAL ORDER, CRASSULACEÆ.

COTYLEDON NEVADENSIS, Watson.—Acaulescent, glaucous: rosulate leaves obovate to oblanceolate, somewhat rhomboidal, acute or acuminate, the larger two to four inches long: Flowering branches six to ten inches high, with scattered lanceolate or broadly triangular acute leaves: inflorescence a rather close-spreading compound cyme: bracts small: pedicels three to nine lines long: sepals ovate, acute, two lines long or less: petals lanceolate, acute, five lines long, yellow tinged with red: carpels very short, ovate-oblong, three lines long in fruit. (Brewer & Watson's *Flora of the California Geological Survey.*)

ONE of our most popular poets, T. Buchanan Read, in a little poem called a "Plea for the Homeless," has a passage which we may well apply to the plant we are about to describe:

> "Sweet plants there are which bloom in sultry places,
> By rude feet trampled in their early hour,
> Which, when transplanted, are so full of graces
> They lend a charm to Flora's fairest bower.
> Oh! ye who pass look down into their faces,
> Displace the dust and recognize the flower."

Not only this species, but many of its associates, have much in their histories which may be suggested by these lines. They grow naturally in hot sultry places, and if they are not all covered with the actual dust, many of them are clothed with a powdery material which gives them precisely the look of dust-covered plants. But the neglect which the poet typifies has been particularly their fate, until, still pursuing the poet's metaphor, the dust has been removed, and now they are among the most highly prized of all plants used in modern decorative gardening. They are known to florists as *Echeveria*, and some species are planted

side by side and used as edgings to carpet beds and other artificially arranged plots of flowers, in which they give an unique character no other class of plants could give so well. They were not particularly valued for their flowers, and hence did not force themselves on the florist's attention. Like the "Homeless" of the poet, they had to be sought for by the curious in the collections of those who loved nature for its own sake, and its worth proved an over-match for beauty. When our American poets turn their thoughts on American flowers, as so many Europeans have to theirs, there will be many pretty pages to read and lessons like these to learn from our own wild flowers.

Our Nevada Cotyledon may not grow exactly in places made dusty by "rude feet," but it inhabits dry stony places, where few would think of looking for a pretty flower. The specimen from which our drawing was made grew on the dry rocks at the head of the Yosemite Valley, and below the celebrated Falls of that name, in which place both Dr. Torrey and Dr. Gray had previously found it. Dr. Bigelow, the botanist of the early Pacific Railroad Survey, in the Report of 1856, notices it as being collected by the party on rocks and hillsides in Sonoma, and at Knights' Ferry on the Stanislaus river. Torrey and Gray, in the "Flora of North America," published in 1840, note it as having been found by Nuttall in San Diego, but do not say under what conditions of growth it was found. But the whole tribe like high and dry places, and are emphatically rock-plants.

In the works last named it is spoken of as an *Echeveria*, and Nuttall, whose collections from San Diego first made botanists acquainted with it, named it *Echeveria lanceolata*. De Candolle thought there were distinctions sufficient to divide the genus from the old *Cotyledon*, the chief difference being that, while the petals were slightly united at the base, so that they would all come off together when mature as a monopetalous corolla in *Cotyledon*, in *Echeveria* they are wholly separate from one another, and it would be called strictly a five-petalled flower. He named the new genus as he supposed it to be, as he tells us, in honor of

Mr. Echeveria, an "eminent botanical artist of Mexico." In these days, however, when the natural affinities of plants are of more consequence than an artificial line drawn through a slight adhesion of the petals, the species are properly remanded back to *Cotyledon*, and Signor Echeveri must lose the honor intended for him. Such misfortunes often happen in botany, and it is chiefly in this way that so many synonyms accumulate. Wherever it is possible, botanists who have a dread of synonyms, retain as much of the original name as possible. For instance, in the present case they might call the plant *Cotyledon lanceolata*, retaining Nuttall's specific name. This plan has the additional value of aiding history, as well as of avoiding synonyms. But here there happened to be already an old-world species named *Cotyledon lanceolata;* so that on the abrogation of *Echeveria*, a wholly new name had to be given to it—*Cotyledon Nevadensis*, by Mr. Watson; and there is nothing left, so far as the name is concerned, to show that Mr. Nuttall had anything to do with its original history. Though reported from San Diego as *Echeveria lanceolata*, it is probably rare there, as well as in California generally, for only a single species, *Cotyledon farinosa*, is included in the recently issued "Popular Flora of California," by Volney Rattan.

Cotyledon is a very ancient name, and signifies a wide shallow cup or vessel. As applied to a plant, it appears in the writings of Pliny, the old Roman writer on natural history; and a well-known European plant, *Cotyledon umbilicus*, is believed to be the species he had reference to. The leaves have at the apex a small shield-like process, at once suggestive of both its generic and specific names, which, in a certain sense, are synonymous. Sibthorp notes that the plant is to this day called Kotyleda by the Greeks of Laconia, the plant being native to that part of the world. The home of the genus is, however, Southern Africa, in which some three dozen species are found. The sections with partially united petals have their home chiefly in Brazil and Mexico, there being, perhaps, a couple of dozen or less, if the limits of the species were accurately determined. Seven species are

recorded in the "Botany of California" as being natives to that State, beyond the boundaries of which none have as yet been found in our territory. The genus seems to have been a wanderer northward from a more southern home; and the different species, therefore, will not probably prove hardy enough to stand the winters in the gardens of many of the States of our Union, but will require some slight protection during the severe season. With this slight care, as Mr. Sargent informs us, it is found of very easy culture, and will probably prove a favorite plant for ornamental gardening.

The old-world plant has had in its time a large number of popular names, such as Kidney-wort, Renny-wort, Navel-wort, Hip-wort, Shield of Heaven, etc., and some of these are still retained by various authors as common names for the whole genus. But as these names are in use for other plants, it seems best to refer to them merely as matters of history. The name Cotyledon has become so incorporated into our language through its use in designating the seed-lobes of plants that it is just as familiar as any common name can be. So it is, perhaps, as well to retain it as a common name, as well as botanical, as we do in Dahlia, Verbena, and many other popular plants.

EXPLANATION OF THE PLATE.—1. Complete plant, natural size. 2. Longitudinal section of the corolla, showing the proportionate lengths of pistils, stamens and petals, somewhat enlarged.

CHEILANTHES CALIFORNICA.

L. PRANG & COMPANY, BOSTON.

CHEILANTHES CALIFORNICA.

SHIELD-LIKE LIP-FERN.

NATURAL ORDER, FILICES.

CHEILANTHES CALIFORNICA, Mettenius.—Rootstock short, creeping, chaffy with narrow dark brown scales; stalks densely tufted, dark-brown, glossy, four to eight inches long; frond four inches long or less, broadly deltoid-ovate, smooth on both surfaces, delicately quadripinnatifid (that is to say, four-pinnate, with all but the primary rachis narrowly winged); lower pinnæ largest, triangular, more developed on the lower side; upper ones gradually smaller and simpler; ultimate pinnules lanceolate, very acute, incised or serrate, and when fruiting with usually separate, crescent-shaped, membraneous involucres in the sinuses between the teeth, which also are often at length recurved. (Eaton in *Rothrock's Botany of Wheeler's Expedition.* See also Eaton's *Ferns of North America.*)

N the work from which we have taken our description, Professor Eaton says of this species: "Moist shady canons and ravines in the coast ranges of California, received by me only from Santa Barbara and Los Angeles counties, but probably of wider range. Sonora, Mexico, *Schott.* A very delicate and pretty fern, and eagerly sought by collectors. Sir William Hooker placed it in the genus *Hypolepis*, a genus of large ferns, which are utterly unlike this plant in habit, and are really much nearer to *Phegopteris* than to *Cheilanthes.* The involucres are lunulate, and of a different substance from the lobule, at the base of which they are placed, but as the sporangia ripen this lobule is frequently reflexed, so as to form a sort of second involucre."

Though this species is named *Cheilanthes Californica*, it is not the only one that is native to that State, as there are several species existing there,—nor is it so abundant as to deserve this particular name, for, though the remark of Professor Eaton that it "is probably of wider range" than his collections indicate, is correct, it is undoubtedly more limited than some others. It was

first found in California in the early part of the present century by that early botanical explorer Nuttall, and the differences noted by Eaton, as above cited, impressed him so strongly that he named it *Aspidotis Californica*, from the ear-like resemblance of the indusium to the *Phegopteris* section of *Aspidium*, the shield-fern. As it was then the only known Californian species of the genus, the specific name *Californica* was distinctive,—but as the variations of ferns have become better understood, modern botanists have discarded the genus, uniting its species with *Cheilanthes*, but have retained the specific name that was originally given to it. The particular manner in which the genus *Cheilanthes* varies may be understood by the following from Mr. John Smith's "Historia Filicum": "The genus consists of about thirty or forty known species of slender fronded ferns, widely spread through the tropics and sub-tropical regions of both hemispheres. They vary considerably in size, and the divisions of the fronds, as also in the indusium, being of various forms, which, in some cases, might be considered sufficient to be of generic value, but as it often varies in form in the same species, it cannot be viewed as of more than specific value. In some it is a distinct, round, inflexed crenule, containing on its axis a single receptacle; in others it is oblong, or more or less elongated, containing two or more receptacles, in some it is straight, in others it is crenulated and wavy." These variations, however, serve very well to divide the genus into distinct divisions, and though *Aspidotis* is no longer a generic name, its relative *Aspidopsis* is employed to designate that section of *Cheilanthes* which has the indusium nearly round—like an *aspidion* or little shield, as seen in our Fig. 2—and special to each cluster of sporangia; and as our species is the only one of that section, we have suggested for it the common name of Shield-like Lip-Fern instead of Californian Lip-Fern, as it is designated in some catalogues.

As noted by Professor Eaton, it will probably be found much more widely distributed than it is generally believed to be. It has been received by the writer of this from several correspond-

ents during the past two years, most of them believing, from the peculiarities already referred to, that they had found a new genus, or at least a new species. The specimen from which our drawing was made was sent by Dr. L. D. Morse, from San Mateo, and supposed to be new. It is a much finer and more delicate form than those generally received, if we may judge from the drawing of one in Mr. Robinson's little book, "Ferns in their Homes and Ours," and also one which has been given in Professor Eaton's "Ferns of North America." In Mr. Robinson's drawing the frondose portion is longer than the stalk; but our drawing, which represents the whole plant, with the fronds of the past season as well as those of the present, shows that this relative length of stalk and frond is as variable as characters derived from the indusium, or from the lobing of the frond, and herein shows the advantage of drawing all the fronds, old as well as new, in order to give a clear idea of the exact characters of the species; though, so far as we know, our work is among the few which give drawings of complete plants in this way. In most descriptions of ferns the proportionate lengths of the fronds and stalks are particularly given. Our drawing shows how this varies in the same plant. There is one frond with the two portions about equal in length, as in Mr. Robinson's drawing,—another has the frondose portion of about the same length as the last, but with the stalk double the length,—while on the old fronds the stalks are very long and slender in proportion to the length of the leafy surface. Indeed, so far as we might judge by the appearances of our picture, it seems to be the rule that the stem is short in proportion to the length and breadth of the leaf-blade,—the smaller the blade the longer the stalk. The knowledge of the rules which govern these seeming variations is of great assistance in enabling the student to decide on the species. Among some of its resemblances Professor Eaton says: "This pretty and delicate fern reminds one, by its general habit, of the still rarer *Cystopteris Montana*. The frond, however, is of rather firmer

texture, and is still more finely divided." But these resemblances are but superficial. When a portion of the fruiting frond, as in our Fig. 2, is examined, the student will have no difficulty in distinguishing it readily from its allies. In its native locations it is found growing on rocks in situations partially shaded from the full sun. It has not yet been much cultivated, but when the opportunity occurs for obtaining it, a knowledge of its natural location will assist its successful culture. A writer in an English paper, who has had experience with a closely allied species of the Pacific coast, says "it must be planted in a select nook in peat and sand, with pieces of limestone placed about it, and it is as well to protect it well during the winter." It is not likely that it would endure the severe frosts of our Atlantic winters, unless the last suggestion is particularly heeded.

EXPLANATIONS OF THE PLATE.—1. A complete plant from San Mateo. 2. Pinnule in fruit, much enlarged.

LIATRIS SCARIOSA.

L. PRANG & COMPANY, BOSTON.

LIATRIS SCARIOSA.

BLUE BLAZING STAR.

NATURAL ORDER, COMPOSITÆ.

LIATRIS SCARIOSA, Willdenow.—Stem stout, pubescent; leaves mostly pubescent, the lowest large, oblong or lanceolate obtuse, the upper linear, acute; heads large, fifteen to forty-flowered, roundish, sessile or pedicelled; scales of the involucre spatulate or obovate, rounded at the apex, usually with broad and colored margins; the outer ones with spreading tips. (Chapman's *Flora of the Southern United States*. See also Gray's *Flora of the Northern United States*, and Wood's *Class-Book of Botany*.)

THE writer's first acquaintance with this beautiful wild flower in a native condition was made in the broad and beautiful lands of the Indian Territory, where, in the language of Bryant,—

> "Free stray the lucid streams, and find
> No taint in these fresh leaves and shades;
> Free spring the flowers that scent the wind
> Where never scythe has swept the glades."

It is one of the most beautiful portions of the United States, and made by nature still more beautiful by the profusion of lovely flowers which everywhere abound. Here, as in other prairie States, the plant is frequently met with, and gives a particularly interesting character to the unique prairie scenery. But it is by no means confined to these parts, for it is found in many light and dry soils from Florida and Mississippi to New England and Minnesota, extending, in a low and dwarfed condition, to the base of the Rocky Mountains, where the writer has collected it not much over a foot high, and with not more than half a dozen of its large heads of showy flowers. In the Eastern States it often makes stems three or four feet high, and we may count its heads by scores. This is particularly the case when removed

to the flower garden, in the rich soils of which stems four feet long are not uncommon; and it was from a specimen brought from Kansas so growing in the writer's garden that the illustration here given was made. In these districts the species now described is known as the "Blazing Star," and the long and more feathery-flowered species "Gay-feather." Our text-books give the names indifferently as applying to the whole genus; but it will serve a useful purpose to retain the former name for the wide, round-headed class, and the latter for those which give the spike a more feathery appearance. The common names given to different species, and then indifferently to any of them, have been very numerous. Rafinesque gives Throat-wort, Sawort, Button Snake-root, Back-ache-wort, Devil's bite, Rattle-snake's master, Blazing Star, Gay-feather, Prairie Pine and Rough-root. Sawort, or Saw-wort, may have been the translation of *Serratula*, in which genus the plants now known as *Liatris* were included by Linnæus. Some of the other names have an evident reference to its properties or supposed medical virtues. The knobby roots have a strong odor of turpentine when bruised, and this explains "Prairie Pine," a name which seems to have originated in Canada. "Button-snake Root" comes from its fame as a remedy in rattle-snake bites; and, as there are so many kinds of "Snake-roots," the "Button," or slightly tuberous roots, have been added as a distinguishing mark. Its "fame" seems to rest chiefly on the authority of Pursh, who says that "the inhabitants of Virginia, Kentucky and Carolina call *L. scariosa* and *L. squarrosa* 'Rattle-snake's master,' and that when bitten by the animal, they bruise the bulbs of the plants and apply them to the wound, while at the same time they make a decoction of them in milk, which is taken inwardly." Medical writers say that the belief in the plant's usefulness against snake-bites is very general, but none of them in these times seem to have any faith in its efficacy. It is singular how notions as groundless as this probably is, come in time to pervade whole communities. Dr. Stearns, who in 1801 published an "American

Herbal," notes: "The flesh of the Rattle-snake, dried and powdered, has been given in consumption," and he candidly adds, "but I never knew it to do any good." If he had lived till our time he would probably make some such remark about "the Rattle-snake's master."

Professor Wood surmises that it was somewhat in relation to its use in rattle-snake wounds that it received its name *Liatris*, of which other botanists say "derivation unknown." He remarks in his "Class-Book," "it is from the Greek *li*, an emphatic prefix, and *atros*, invulnerable; because used as a vulnerary." Others, as Darby for instance, say it is derived from the Greek *liazo*, "I come forth," in allusion to the early appearance of the leaves in spring. But these are but guesses. By Linnæus, what we now know as *Liatris* was included in *Serratula*. Jussieu, in 1789, referring to *Kuhnia*, remarks: "Here also are placed those species of *Serratula* having naked receptacles." Schreber following in 1791, perceived that this portion of those with "naked receptacles" did not belong to *Kuhnia*, and it is just possible, with this smooth receptacle in his mind, he derived the name from the Greek *leia*, or smooth. This point, however, though it might have suggested the original name, would be of no importance in distinguishing the genus at this time, for nearly all its immediate allies have naked receptacles, with the single exception of a genus called *Carphephorus*, which has a chaffy receptacle. This genus was once included in *Liatris*, but has been removed chiefly on account of this chaffy character. The receptacle, as the reader knows, is the broad base on which the little florets are supported, and which is surrounded by the greenish scales, forming the involucre. The chaffy scales referred to are merely very much abbreviated stem leaves, and which in many cases are wholly wanting, and in such cases we have what is known as the naked receptacle. The presence or absence of these abbreviated leaves or chaffy scales is much relied on by botanists in distinguishing genera,—so much so that, as we have seen, a genus distinct from *Liatris* has been made chiefly from this point

of view. But as showing how little there is in nature, beyond the apparent permanence of these little characters, to divide one genera from another, she herself takes occasion sometimes to teach us. In regard to *Liatris*, distinguished by its naked receptacle, Mr. N. Coleman, author of the "Catalogue of the Plants of Michigan," in a private letter to the writer, dated May 7th, 1875, says: "I have occasionally found long purple scales like those of the involucre intermixed with the florets in *Liatris*." Such facts are always appreciated by the modern botanical student, as they furnish the means for unlocking many of what to our forefathers were the mysteries of nature, and are indeed the basis of what is known in these days as the doctrine of evolution.

The whole genus *Liatris* is a particularly handsome one, and this species—the "Blue Blazing-Star," of Mrs. Lincoln's botany, —is at least as handsome as any. The roundish heads of flowers are large and brilliantly colored, and in many cases the involucral scales have colored tips, though sometimes whitish and like mere membrane, and it is from this fact that the name *scariosa* has been given to it, this signifying a dry, chaffy condition. Michaux was struck chiefly by the roundish heads, and describes it *Liatris spheroidea*, but it was described a few years before by Willdenow as *L. scariosa*, and this, being the prior name, is adopted.

EXPLANATIONS OF THE PLATE.—1. Upper portion of a spike, the uppermost flower opening first. 2. Central portion of a leafy stem. 3. Side and back view, showing the colored scales of the involucre. 4. Akene and pappus.

CYPRIPEDIUM CANDIDUM.

L. PRANG & COMPANY, BOSTON.

CYPRIPEDIUM CANDIDUM.

WHITE MOCCASIN FLOWER.

NATURAL ORDER, ORCHIDACEÆ.

CYPRIPEDIUM CANDIDUM, Muhlenberg.—Sepals ovate-lanceolate; lip white, flattish laterally, convex above; sterile stamen lanceolate; leaves lance-oblong, acute. Plant a little larger than Cypripedium arietinum, slightly pubescent, one-flowered; petals and sepals greenish, not much exceeding the lip, which is less than one inch long. (Gray's *Manual of the Botany of the Northern United States.* See also Wood's *Class-Book of Botany.*)

THE flower now known as Cypripedium was formerly "Our Lady's Slipper," and is known to the moderns as Venus' Slipper, Shoe or Sock. The flowers have some resemblance to a shoe, but most probably if Venus had the same regard for a neat fit as characterizes the ladies of our time, she would not feel complimented by the selection of a shoe like this for her. The style is much more suited to an Indian's foot. It resembles a moccasin more than anything the Goddess of Beauty could be supposed to wear. It is commonly known as the moccasin flower, and for the reason above given we have adopted the name as our leading common one.

Most moccasin flowers of the United States grow in thin woods or partially shaded places, but the "White Moccasin Flower" here illustrated is found in somewhat more public situations. It is the only one which seems at home in the open prairie, on which, indeed, very few orchideæ grow. The Rev. Mr. Greene tells us, in the third volume of the "American Naturalist," that on the prairies of Illinois only three orchids are found, and of these *Cypripedium candidum*, our white moccasin flower, is one. From its general place of growth it is probably

the kind referred to by Bryant in his touching poem, "The Maiden's Sorrow":

"Seven long years has the desert rain
Dropped on the clods that hide thy face;
Seven long years of sorrow and pain
I have thought of thy burial-place.

"Thought of thy fate in the distant West,
Dying with none that loved thee near;
They who flung the earth on thy breast
Turned from the spot without a tear.

"There, I think, on that lonely grave,
Violets spring in the soft March shower;
There, in the summer breezes, wave
Crimson phlox and moccasin flower."

White flowers are generally selected as emblems of purity, and are used as tributes alike at marriages and funerals, both to the birth and to the death of love. The *Cypripedium candidum* is our only white species, and whether it actually was or not the "moccasin flower" in Bryant's mind, it is of all the most fitted to deck a maiden's lonely grave.

The white moccasin flower has been known to botanists only within a comparatively recent date. Muhlenberg, the distinguished Pennsylvanian, records it in his "Catalogue," published in 1813, and gives Pennsylvania as the only State in which it was then known to exist. Rafinesque, writing in 1826, gives Ohio in addition to Pennsylvania, and we see how limited must have been the knowledge of it even in that time. Dr. Asa Gray, in his "Manual of Botany," says it is now found from Central New York to Kentucky and Wisconsin. Of special locations, of which we have records before us while writing, we find it is found in Ohio, Nebraska, Southern Michigan, Iowa, Indiana and Illinois. Its central home may perhaps be considered as Michigan and Iowa,—at least in these States it grows in considerable abundance.

The distribution of orchids over the surface of the globe is one of the interesting subjects just now specially attracting the atten-

tion of botanists. Many species of this family are wholly dependent on insect aid for the fertilization of their flowers. It is believed that it is better for species or race that the individual plant should be occasionally, at least, crossed rather than perpetually to receive its own pollen. In view of these prevalent opinions, it may be noted that orchids, dependent on insect aid, are not often widely distributed in comparison with other plants, and notes of the disappearance of species from some localities are not uncommon. In regard to our present subject, the White Moccasin Flower, Dr. J. Schneck tells us, in the report of the "Indiana Geological Survey," that it seems to be gradually disappearing from the flora of the Lower Wabash region. Mr. Darwin tells us, in his charming work, "On the Fertilization of Orchids," when writing of *Cypripedium*, that "an enormous amount of extinction must have swept away a multitude of intermediate forms, and has left this single genus, now widely distributed, as a record of a former and more simple state of the great orchidaceous order." Some orchids now existing fertilize themselves, and it would be an interesting point to decide whether these departed species were of this class, and chiefly only those which had the benefit of cross-fertilization endured. But it is a fact worth noting by the student that, even with this supposed benefit, probably more species will be marked in our works on botany "rare" among orchids than among any other tribe of plants.

The white moccasin flower has been of use to botanists by affording, through variations, some key to the real structure of the orchideous flower. Mr. Darwin quotes Professor Asa Gray as saying, of "a monstrous flower of *Cypripedium candidum*, 'here we have (and perhaps the first direct) demonstration that the orchideous type of flower has two staminal verticils, as Brown always insisted.'" By this is meant that orchids were primarily designed to have six stamens in verticils of three each, but the tendency in orchideæ is to unite these primordial parts into a single column, resulting in these odd-shaped flowers. The study

of these malformations is called teratology, and it has become one of the most interesting branches of botanical science, as by its aid many problems in plant structure are explained. In the light of teratology malformations in orchideous plants are particularly interesting to the student, and, when observed, should be carefully preserved. Our present species is well worth watching for them. In the first vol. "Botanical Gazette," page 34, Mr. Herbert E. Copeland says: "Bearing on the proof of intergrading of parts are wild double flowers. It is not unknown that the best efforts of the florist are often anticipated in the woods. I have three specimens of *Cypripedium candidum* with two lips each, at the expense of the sepals of course," and we may add that in the hands of the vegetable morphologist such a specimen has an inestimable value.

Cypripedium candidum grows generally in open boggy places, and flowers in May and June. The drawing was made from a specimen collected in Nebraska by the author.

POLYGALA LUTEA.

L. PRANG & COMPANY, BOSTON.

POLYGALA LUTEA.

YELLOW MILK-WORT.

NATURAL ORDER, POLYGALACEÆ.

POLYGALA LUTEA, Linnæus.—Stem simple or with spreading branches; leaves lanceolate, acute, the lowest clustered, spatulate-obovate, obtuse; spikes dense, globose, or oblong; wings elliptical, abruptly pointed; lobes of the caruncle nearly as long as the obovate, sparse hairy seed. (Chapman's *Flora of the Southern United States.* See also Gray's *Manual of the Botany of the Northern United States,* and *Wood's Class-Book of Botany.*)

ONE of our text-books observes that this is a beautiful species, and another that it is a very showy one. Examined by the critical rules of art it would scarcely be called beautiful, nor is it particularly showy, and yet it must be conceded to have good personal attractions. What might have been stately in its character, with more development, ended in stiffness; and variety, which gives a charm when other more solid graces are wanting, is almost absent here. We have leaves of an almost uniform tint of green, with little variation in outline, and without even a little wavy edge, which some heavy leaves have to lighten them. There is the short stem, as straight as if set up by rule, and of the same shade of green as the leaves. The orange-yellow color of the flower is the single redeeming feature of the whole, for the head is destitute of all beauty in its outline. All that can be said in its favor in this respect is that it harmonizes in this hardness with all the other lines. It has been called Yellow Bachelor's Button in the South; and if the bachelor's life is to be looked on as one typical of loneliness, there may be some appropriateness, considering how few of the elements of the enjoyable we find in this plant. But if not in itself beautiful, it has the trait which is so often found in homely things, of lending a charm to the sur-

roundings and rendering them lovable. There are few plants which seem to have so great a power of aiding the beauty of a piece of wild scenery as our yellow milk-wort. It is a rare color among our wild flowers, and it gives a peculiar richness to all the rest.

The genus to which it belongs is a very old one, a European species having been known as *Polygala* for many centuries. The particular species is *P. vulgaris*, and grows over most of Europe. The name is from the Greek *polys* much, and *gala* milk, and hence we have the common English name of milk-wort. Authors do not seem to have been as careful to be right in matters of history as in most other matters connected with plants, and so we frequently have contradictions which must often puzzle the young student who desires to be accurate in all things. Thus in the derivation of *Polygala*, some authors, as old Gerarde for instance, tell us it was so called because it causes an increase of the milk in the breasts of nurses; and others, as in most of our modern text-books, that it helps the yield of milk in the cattle that feed on it. Others say it is because some of the species abound in a milky juice. Dr. Asa Gray, in "School Botany," observes on this: "but the plants have no milky juice at all." Then again Dr. M. T. Masters tells us: "Some of the milk-worts moreover abound in milky juice at the roots, but the name is in all probability derived from the increase which it gives to the lacteal secretions of cows." In ancient times it had some religious associations. The hermits in the European Alps always carefully planted it round their habitations. In Catholic countries the three days before Easter Sunday are called rogation days, and are marked by public religious ceremonies; and Mrs. Paterson notes in her "Folk-Lore" that in the processions on these days bunches of the milk-wort were carried, and hence it is known in these places as "Rogation-flower." Rogation days, coming in Passion week, made it also sought after for Passion ceremonies, and known as "Passion-flower."

Polygala lutea, the species we now describe, has not the for-

tune of the European species in boasting of much popular history. As already noted, it is known in the South as "Yellow Bachelor's Button," from its great resemblance in form to the *Gomphrena globosa*, the Bachelor's Button of gardens; but as there is a yellow, as well as a white and purple of this, it seems best to try to keep yellow milk-wort for a distinctive popular name. The roots have a pleasant aromatic flavor, very like that of *Gaultheria procumbens*, the "Tea-Berry" of New Jersey, and among which the Polygala grows. Some of the species have achieved remarkable medical celebrity, but nothing especial is recorded of this particular one.

The genus Polygala will always have an interest to the botanical student, from the remarkable structure of its flower. The parts of all flowers were primordially leaves, that is to say, what might, under some circumstances, have been leaves have become parts of the inflorescence. The transition from leaves to floral parts is always marked by a more rapid coiling of the spiral growth which exists in all plants; but with this rapid coiling up comes growth waves which have varying rhythmic intensities, and by which each wave is distinctly marked. In plants allied to *Polygala*, five of these primordial leaves would be caught in the wave of growth before comparatively resting, and these would then form a calyx whorl of five divisions. The next wave, with the same scope, should arrest five more primordial leaves; and the force, having less intensity, would result in five colored divisions of a corolla. But in the case of *Polygala*, the growth wave seems to have caught but three primordial leaves to form a calyx, leaving two of the usual number to be affected by the next wave, and thus we have two of what usually would have been calyx segments acting as part of the corolla. In our Fig. 2 we have given a back view of a flower, showing the two enlarged divisions and two of the three small ones, the other being in front. Having traced the typical and the actual flower thus far, the student will look for the next whorl of five, which should form the five petals, but so far two of these have not been traced. The remainder of

the corolla seems to be formed of only three pieces, and which, in some allied orders, would be separate, but here they become united. Whether in this unusual condition for plants in this ordinal connection, the other two have remained wholly undeveloped or have been really made to form a part of what appears to be but a trimerous corolla is not yet known, and the hope of getting a clue to this may give some zest to teratological studies in this direction.

Polygala gives the name to the whole order Polygalaceæ, and furnishes the greater part of the species. Some of them are found in most of the temperate portions of the globe. Our yellow milk-wort is very common in New Jersey, and from thence south to Florida, but has not found its way far to the west, except in the latitude of Arkansas, in which State it reaches its western boundary. So far as we can ascertain it has not even been found in Ohio.

It does not take well to cultivation. It is included in some catalogues of botanic gardens as having been cultivated in England at different dates, but it is rarely seen there now.

EXPLANATIONS OF THE PLATE.—1. A plant from New Jersey of average size. 2. Back view of a flower somewhat enlarged. 3. Front view.

SCHIZÆA PUSILLA.

L. PRANG & COMPANY, BOSTON.

SCHIZÆA PUSILLA.

NEW JERSEY SCHIZÆA.

NATURAL ORDER, FILICES.

SCHIZÆA PUSILLA, Pursh.—Sterile fronds linear, very slender, flattened and tortuous; the fertile ones equally slender, but taller, and bearing at the top the fertile appendage, consisting of about five pairs of crowded pinnæ. (Gray's *Manual of the Botany of the Northern United States.* See also Wood's *Class-Book of Botany*, and Eaton's *Ferns of North America.*)

THIS pretty little fern has an unusual interest to the collector of our native plants from the fact that it has no close relations in this country; that it has been found in but a few locations in New Jersey and not abundant in any of them; and because its discovery is of comparatively recent date, and most persons who go into New Jersey on botanical explorations are generally on the alert to discover new locations for the great rarity.

The history of the discovery will afford us some lessons on the "truths" of history, and will illustrate a point we have often had occasion to dwell on in the preparation of these chapters, that authors scrupulously accurate in the description of plants, or matters which come directly under their own eyes, often exhibit great carelessness in matters no less important, but which are only incidentally associated with the plants they describe. In the Herbarium of the Lyceum of Natural History of New York, with a specimen of the *Schizæa*, is this label in the handwriting of Dr. Torrey: "First discovered by Dr. C. W. Eddy, near Quaker Bridge; Dr. Eddy was in company with J. Le Conte, Pursh and C. Whitlow, and though he and Mr. Le Conte found all the specimens, Pursh has claimed the honor of the discovery himself." This is signed "Torrey and Cooper, 1818." Underneath this another note signed "Cooper," which says, "First found in 1805, not found

again till detected by me in company with Dr. Torrey in 1818." How improbable it is that Pursh and Eddy discovered the plant in 1805 may be seen from the fact that Eddy's aunt was the wife of Dr. Hosack, who established the New York Botanic Garden, and that Pursh went to take charge of this Botanic Garden in 1807, and in all probability made the acquaintance of Dr. Eddy, then very young, through his engagement with the uncle. Moreover, Pursh tells us in his preface that he was absent, in 1805, in the South, and in the West in 1806. Further it appears from a letter of Dr. Muhlenberg to Zaccheus Collins, dated April 28th, 1812, and preserved in the Library of Academy of Natural Sciences, of Philadelphia: "Schizæa tortuosa was discovered last year (1811) by Mr. Pursh and Dr. Eddy." Even at this time there seems to have been some wrangling as to who discovered it, for in another letter the same letter-writer, referring to a visit from C. Whitlow, says: "If all that he says in his good humor can be depended on, he found the *Schizæa tortuosa* at the Quaker Bridge." Even the claim of Mr. Cooper, that he and Dr. Torrey were the first to re-discover the plant, may be barely correct; for in another letter in the same collection, from Mr. Collins to Dr. Bigelow, of Boston, dated August 3d, 1818, he speaks of having been there the past season and of finding the plant, as if not knowing that any botanist had had the same good fortune before him that year. Again, Professor Eaton says the plant was found by Dr. Eddy in 1813, but as the preface to Pursh's Flora was written in London that year, this cannot be. In spite of all these varying statements it appears probable that Pursh took a trip to New Jersey with Eddy late in the autumn of 1811, after his return from the West Indies, and before sailing for Europe to prepare for his great work, and it is very likely that they both found it so nearly simultaneously that either may be justified in claiming the discovery. Some may say that these matters are of little consequence; but if a fact is worth recording at all it is worth recording accurately, and it is to impress this on the student that we have given this question so much consideration here.

Dr. Caspar Wistar Eddy, whose name is so prominent in connection with the discovery of this fern, was a relative of Dr. Samuel L. Mitchell, the founder of the New York Lyceum of Natural History, of which young Eddy was one of the incorporators. He was very zealous in the cause of botany for a while, and Torrey named a genus *Eddya*, after him. In 1814 he began an edition of Miller's Dictionary. The next year we read of his proposing to write an elementary work on botany, "preserving the best features of the Linnæan system," but expunging all the terms that had relation to the sexes of flowers. But this seems to have been also abandoned, for soon after we find him projecting the issue of a popular colored Flora of the United States, similar to that we are now engaged in. He died soon after, still young in years.

By Muhlenberg's letters it appears that it was Pursh's intention to call the newly discovered *Schizæa*, *S. tortuosa*, in allusion to its twisted fronds; but when his work was issued it was described as *Schizæa pusilla*, the name it now bears. This is, perhaps, in consideration of its small size in comparison with other species, of which there are over a dozen, found chiefly in tropical America, Australia, the islands in the Pacific ocean, southern Africa and the Himalaya mountains. Most of these have the peculiarity of our species in being locally distributed and not occurring to a very wide extent in any one place. Since the first discovery at Quaker Bridge, it has been found in a few other places in New Jersey, and recently in Nova Scotia. In these spots the country is almost impenetrable from the dense vegetation clothing the swamps, and those who explore have to follow closely the track of those who have gone before. It will, no doubt, be found more abundant some day.

The plant now illustrated was gathered by the author in a location discovered by Mr. Charles F. Parker on the Atsion river. It was growing in company with *Drosera filiformis*, cranberries, and small sedge grasses, just as represented on the plate; and *Sarracenia purpurea* and many ericaceous plants were growing

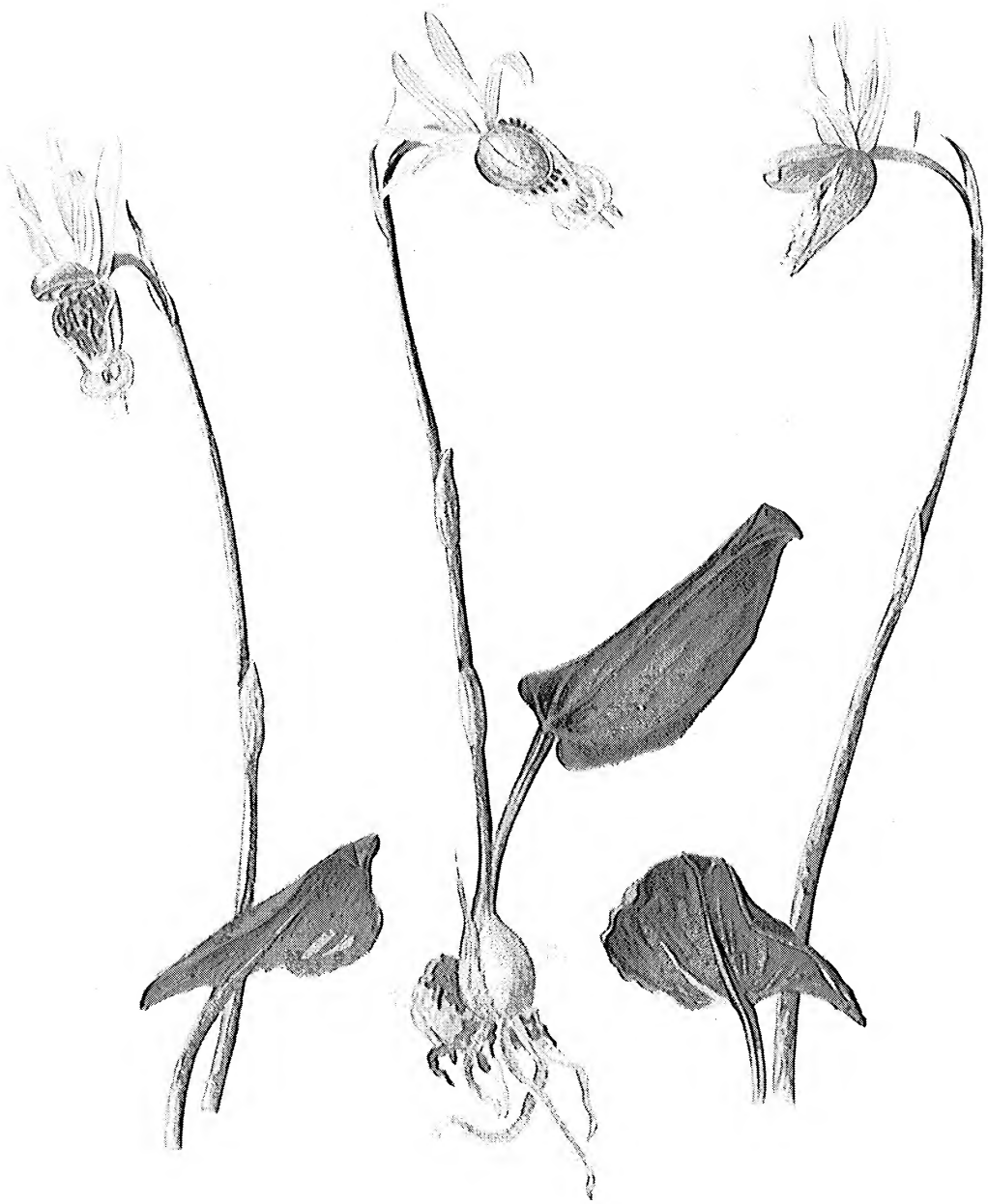
among the scattered oaks and *Cupressus thuyoides*, which shaded the whole spot. Close by was an impassable swamp. This was in the end of July, and a good time to show the commencement of maturity in the fructification, as in the enlarged drawing, Fig. 2.

The structure is interesting in many respects. In many ferns the barren fronds are the largest, the fertile fronds rather contracting at fructification. Here it is reversed, the twisted thread-like lines at the base being the early barren fronds. Usually the twisting is described wholly in connection with these barren fronds,—but as we see by our plate, the fertile ones are disposed this way also.

The peculiar structure of the infertile fronds was made the subject of a communication to the Academy of Natural Sciences of Philadelphia, by Dr. J. Gibbons Hunt, in the volume for 1874. He says: "The barren frond is marked on its epidermal surface with a double line of stomata, and these organs extend the entire length of the frond. The cells which make up the interior of this delicate fern are cylindrical and vary in size, but their distinctive characters lie in minute projections or outgrowths from all sides of the cells, and these projections meet and are reticulated with corresponding outgrowths from the adjoining cells, so that the cells of Schizæa have, penetrating between them in every direction, intercellular spaces and channels of remarkable regularity and beauty; and so characteristic is this plan of cell union that the botanist need find no difficulty in identifying the smallest fragment of the plant."

The name *Schizæa* was suggested to Sir James E. Smith, who established the genus, by the manner in which the fertile frond is delicately cut and divided, from the Greek word *schizo*, to cut.

EXPLANATIONS OF THE PLATE.—1. A full-sized specimen, with barren thread-like twisted fronds at the base, and fertile fronds of more or less maturity at the top. 2. An enlarged lobe or boat-like division of the fertile frond, with sporangia or capsules just opening. 3. Fertile frond. 4. Leaves of *Drosera filiformis*. 5. Leaves of a *Carex*. 6. Small branch of a cranberry. 7. Fronds of a moss (*Hypnum*).



CALYPSO BOREALIS.

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CALYPSO BOREALIS.

CALYPSO.

NATURAL ORDER, ORCHIDACEÆ.

CALYPSO BOREALIS, Salisbury.—Scape six to eight inches high, bearing a single large flower at top and sheathed with several bracts. Leaf broad-ovate, smooth veined, one to two inches long. Flower near the size of Cypripedium, variegated with purple and yellow, the lip the most conspicuous part, bearing two projecting points beneath the apex. (Wood's *Class-Book of Botany*. See also Gray's *Manual of the Botany of the Northern United States*.)

THE curious tribe of Orchidaceæ, to which the Calypso belongs, is not only remarkable for the many odd forms the flowers assume, but also for peculiarities of behavior which have puzzled the most acute observers to explain. In many families of plants there are distinct lines of relationship that can be distinctly traced between one genus or another; but in Orchidaceæ there are often what appear to be huge gaps, and the families seem wholly alone. Modern doctrines demand that all plants should at some time in the past have been evolved from parents but slightly differing from them. If this be true, the isolation suggests that innumerable species of orchids must have appeared, have lived for ages perhaps, and have been destroyed, leaving these very lonely genera as the survivors, as if by some lucky accident. One of these fortunate circumstances is believed by some botanists to be the aid which they receive through cross-fertilization by insect aid, and to which plan orchids in general are particularly adapted. It is supposed that by this system of cross-fertilization a race is rendered more vigorous, and thus able to endure longer than if each individual continually used its own pollen, or, as it is termed, practises self-fertilization. In many cases, orchids

would not be able to perfect seeds at all, if they had not the aid of insects in introducing the pollen to the stigma. But again, it has been noticed as singular that though the individual plant may have matured innumerable seeds, yet they rarely grow when in a state of nature, and just about as many plants and no more are found in the same locations year after year, the plant making but one new tuber in the place of the one decaying from the last season. A locality soon disappears if collectors of wild flowers abound. The seed, therefore, in many cases, is of very little use to the orchid after all the trouble that has been taken to secure for it the supposed best advantage.

Our Calypso is a good illustration of some of these points. It has no very near relatives, though Linnæus supposed that it was a *Cypripedium*, and it is found noticed as *Cypripedium boreale* in his works and the works of others of that time. Its real relationship, however, is with *Cœlogyne*, a genus inhabiting the warmer parts of the East Indies. Its closest relations in this country are perhaps *Liparis*, or *Microstylis*, and we see by this comparison how isolated *Calypso* must be, especially when we learn that instead of a warm sub-tropical climate, in which most of the *Cœlogyne* are found, this one exists only in the extreme north of our country, and Lapland and Russia, in the extreme north of Europe. Again, it is remarkable for being often found only as an isolated plant here and there. The botanist is as likely to find only a single one in a day's walk as a large number together. This isolation has been the subject of some lines by a well-known botanist, Mr. W. W. Bailey, of Providence, Rhode Island, which, as we love to note especially all attempts to place American plants in the "Language of Flowers," are reproduced here:

"Calypso, goddess of an ancient time,
(I learn it not from any Grecian rhyme,
And yet the story I can vouch is true,)
Beneath a pine tree lost her dainty shoe.

"No workmanship of mortal can compare
With what's exhibited in beauty there,

And looking at the treasure 'neath the tree,
The goddess' self I almost hope to see.

"The tints of purple and the texture fine,
The curves of beauty shown in every line,
With fringes exquisite of golden hue,
Perfect the wonders of the fairy shoe.

"The goddess surely must have been in haste,
Like Daphne fleeing when Apollo chased,
And leaving here her slipper by the way,
Intends to find it on another day:

"And will she come to seek it here or no?
The day is lengthening, but I cannot go,
Until I see her bring the absent mate
Of this rare beauty, though the time is late.

"I watch, but still no classic form I see,
Naught but the slipper 'neath the forest tree;
And so, for fear of some purloining elf,
The precious relic I secure myself."

When, however, the plant is found in a spot it loves, the botanist need not dally till the day is spent, and then be rewarded by one only "dainty shoe." A correspondent of the writer, Mr. C. C. Pringle, under date of April 30th, 1879, remarks: "There is a good deal of Calypso scattered over northern Vermont and adjacent regions. I have never found it except under the protection of *Thuja Occidentalis* (which form the so-called Cedar-Swamps in the north). In these cedar-swamps it is at home where the trees are the oldest and largest. Where the shade is so dense that not even the mosses have strength to crawl over the surface; often near dark and slow-flowing streams, but in situations never, I think, overflowed; in the black and ever moist and cool mould, formed from the decaying fragments of the cedars, this exquisite little beauty lifts her modest head, and, like *Aplectrum*, its leaf is hyemal, appearing in October, and dying away at the beginning of the succeeding summer. Its flower bud is well developed in autumn, and thus the plant flowers as early as the last of May, or with the apple trees."

It was from the plant's solitary habit, blooming alone in beauty away from all her floral sisters, that its name Calypso was sug-

gested, she being a beautiful nymph, according to ancient story, and the Goddess of Silence. It is related of Ulysses that he was for twenty years a wanderer over the earth. He was wrecked on an island called Ogygia; and here in this strange, silent place, the exact locality of which, as the poet intended, is not even now known, he found the beautiful Calypso. The story of Ulysses' departure from the charms of the goddess, in spite of all her alluring entreaties to remain, is a very attractive one; and might be regarded as something more than a mere fable when a cool-headed modern botanist, under the guise of verse, tells us he tarried long under the forest trees in the hope of finding merely the damsel's shoe!

As to locality, it was at one time thought to be very rare in the United States. When Dr. Torrey wrote the "Natural History of the State of New York," only three localities were known,—one in Jefferson and one in Lewis counties, of that State, and the other in Vermont; but since that time Parry, Hall, Brandegee and others have found it not uncommon in damp woods in the Rocky Mountains, and it is likely to be found much more common as we travel northwest, which is in the direction of its central home. It is not always confined to low damp places. A writer in the *Gardeners' Monthly*, for 1869, finds it near Ottawa, in Canada, "in a slight depression on the top of a limestone ridge, the highest ground in the vicinity, sparsely covered with white pine. The plants were growing in turnovers, as they are commonly called in Canada, that is, in the holes caused by the tearing up of the roots and super-incumbent earth when forest trees are up-rooted by the storms. The leaves of the pines having collected in these holes, and decayed there, have formed a rich vegetable mould, covering to the depth of five or six inches the broken fragments of limestone left in the hole." This little sketch is very interesting as showing the nice conditions under which the seeds may occasionally grow, for it is reasonable to suppose that under the circumstances related, they originated there from seed.

CASSIA NICTITANS.

CASSIA NICTITANS.

SMALL-FLOWERED WILD SENSITIVE PEA.

NATURAL ORDER, LEGUMINOSÆ.

CASSIA NICTITANS, Linnæus.—Stem oblique or procumbent, six to twelve or fifteen inches long, slender, branching, roughish-pubescent; leaflets six to twenty pairs, sub-linear, about half an inch long, slightly irritable; common petiole about half an inch in length below the leaflets; raceme two- to three-flowered subsessile, rather super-axillary; flowers small, yellow; stamens five, nearly equal; legumes an inch or inch and a half long, hirsute with appressed hairs. (Darlington's *Flora Cestrica.* See also Gray's *Flora of the Northern United States*, Chapman's *Flora of the Southern United States;* and Wood's *Class-Book of Botany.*)

HIS has received the popular name of Wild Sensitive plant, but it has but a very remote relationship with the well-known Mexican plant grown in gardens, and immortalized by Shelley's "Sensitive plant," commencing with the well-known lines:

> "A sensitive plant in a garden grew,
> And the young winds fed it with silver dew;
> And it opened its fan-like leaves to the light,
> And closed them beneath the kisses of night."

Yet the popular mind may well be pardoned for this association of the two, for not only does it "open its fan-like leaves to the light," but it also has in a slight degree the peculiar power of closing them when irritated. It is, however, more sensitive to changes of light than to touch, at least in the comparatively northern region of Pennsylvania, from whence our illustration was made. Its original home was probably far to the South, for the genus, consisting of an immense number of species, abound chiefly in tropical America; and this one is abundant in the West India Islands, from whence in ages long since passed it may

have made its way to this continent, and have travelled through the eastern portion of the United States, over almost every portion of which, this side of the Mississippi, it is now found. Favoring its probable tropical origin it does not germinate early in the season, or until the weather becomes warm,—nor does it grow in any but dry and warm places. Indeed the warmer the situation the better it thrives in the more northern locations. Very often it is the only plant which seems to luxuriate in some hot sandy waste; and when seen in large masses, as they sometimes are, to the exclusion of almost all other kinds of vegetation, the effect is unique indeed. Its favorite location seems to be a hot and dry railroad embankment. In these situations the leaves may often be noted partially closed after the passage of a train of cars, as if the vibration had effected the change; but yet, when the leaves are lightly handled by the curious observer, it is not till some time after that any change is noticed. If, however, it be handled roughly it soon closes, especially if a branch be gathered; and those who may take a specimen home for the purpose of making a picture will have but their labor for their pains. It may perhaps be owing to this fact that there are very few, if any, good pictures of the species in existence; and we shall probably have the thanks of the curious botanist, as well as of the mere lover of pretty plants, for the excellent drawing Mr. Lunzer has made for our work. It was found impossible to take it accurately in his studio, so it was made from a plant just as it grew in the open ground on a wild place near Germantown.

In the past times the floral artist might readily excuse himself for not offering it as a popular picture, because the plant has not gay flowers; but in these more highly cultivated days we find beauty where our forefathers never thought of looking, and enjoy things which they scarcely believed worth a thought at all. Hence so widespread in our times is the great love for ferns, which have no proper flowers and seldom any color; but we see much to admire in their texture, outline, direction, plan, and the proportions and harmonies of their lines; and we often find them

have more expression than the gayest-colored flower ever gave. Our wild sensitive plant—*Cassia nictitans*—has all the beauty we can trace under these considerations as noted in many ferns, with the addition of varied contrast which the seed-vessels afford, besides the charm of color which the golden flowers, though small, give to the whole picture. Even the single branch as given in our illustration has in some degree all the elements of beauty; but to have the full benefit of the effect, a plant should be seen as it grows naturally, and when a single plant is not crowded by others. In these conditions it makes a regular globose branching plant that is particularly pleasing; and the plant is well worth cultivating by those who have a taste for this more refined style of beauty.

The plant is called by some botanical writers "The Twinkling Cassia;" twinkling being the translation of its specific name, *nictitans*. The application is not very clear. It seems to have been suggested by the flowers. The name *Cassia nictitans* is generally credited to Linnæus, as in so many similar cases. But before his time plants had only one—the generic name, which for each species was followed by a string of adjectives descriptive of the particular plant. Linnæus was the author of the binomial system, or that which confines the name to two; and to do this in many cases he simply struck out all the adjectives but the one which seemed to him the most distinctive. In the case of the present plant, Plukenet, an author of the date of 1705, wrote of it that it was a "Cassia . . . floribus parvis nictitantibus," that is to say, with small twinkling flowers; and we see how Linnæus obtained the name, though we may not understand exactly how the flowers "twinkle." In common with other allied species of *Cassia*, the leaves have been used medicinally as a substitute for the true Senna, which, according to Dr. Riddell, has obtained for this species in Ohio, the name of twinkling senna.

In its more especial botanical features the small size of the flowers are remarkable in a genus which has for the most part large and showy ones. In spite of this lack of attraction the

plant yields seeds very abundantly; almost every flower produces a perfect seed-vessel. In the 3d Vol. of the "Botanical Gazette" a correspondent refers especially to the ease with which this species produces seed-vessels. The plant is an annual, and is usually dead, or nearly so, before October. In the correspondent's case the plants had been mown off in the summer, and as is usual with annuals under such circumstances, had its life prolonged in consequence. Instead of being nearly dry, these October plants were blooming freely, but without petals in most cases. The few which had petals, never developed beyond the calyx, which kept them closed. But the stigmas protruded through the closed mass of petals, evidently without receiving any pollen on their stigmatic surfaces. Still they produced full-sized capsules, though with no perfect seed in them. The case is worthy of further investigation.

CUSCUTA GRONOVII.

L. PRANG & COMPANY, BOSTON.

CUSCUTA GRONOVII.

COMMON AMERICAN DODDER.

NATURAL ORDER, CONVOLVULACEÆ.

CUSCUTA GRONOVII, Willdenow.—Stems coarse, climbing high; flowers mostly five-cleft, in close or mostly open paniculate cymes; corolla bell-shaped, the tube longer than (or sometimes only as long as) the ovate obtuse entire spreading lobes; scales large, converging, copiously fringed, confluent at the base; pod globose, umbonate, brown. (Gray's *Manual of the Botany of the Northern United States*, Chapman's *Flora of the Southern United States*, and Wood's *Class-Book of Botany*.)

IT is interesting to note how differently the same object will impress different people. In this case we have the common Dodder, known to the people of the Southern States as "Love-Vine," as we learn from Darby and other Southern writers. It is difficult to imagine why a plant which winds itself around another, sucking the life from that which it clings to, should be suggestive of love, unless it be of that species which was in the mind of Byron when he thus apostrophized:

> "Oh love! what is it in this world of ours
> That makes it so fatal to be loved? Oh why
> With Cypress branches hast thou wreathed thy bowers
> And made thy best interpreter a sigh!"

The true affection which

> "Where it toucheth clingeth tightly,
> Round glossy leaf or stump unsightly,
> And from its spirit wandereth out
> Tendrils spreading all about,
> Knitting all things to its thrall
> With a perfect love to all,"

if we may make this application from Lowell's "Threnodia," is

anything but the selfish attachment which the Dodder has for other plants, which is very different from anything worth associating with love. The French emblematists take a very different view of it. They have dedicated it to "meanness," because says an anonymous writer, "as soon as its stalk can meet with that of another plant it fattens on it; then, like a vile parasite, this plant absorbs all the juice of its support, and kills it." Dr. Erasmus Darwin, whose curious poem, "The Loves of the Plants," issued in the beginning of the present century, still survives in public interest, took a very mercenary view of the love shown by the Dodder:

"———, the fair *Cuscutæ*, please
With labored elegance, and studied ease;
In the meek garb of modest worth disguised,
The eye averted, and the smile chastised,
With sly approach they spread their dangerous charms,
And round their victims wind their wiry arms.
So by Scamander when Laocoon stood,
Where Troy's proud turrets glittered in the flood,
. . . . .
Two serpent forms incumbent on the main,
. . . . .
Ring above ring, in many a tangled fold,
Close and more close their writhing limbs surround,
And fix with foamy teeth the envenomed wound."

But setting aside all that is ideal we may say that the plant is really a parasite, though unlike many parasitic plants it commences life in a creditable way; for the seed germinates in the ground instead of on other plants, and it is not until the growing stem has found some other kind to cling to, that it severs its connection with the earth which bore it, and lives wholly on the victim it has caught. In the case we illustrate it has seized the common Blackberry, *Rubus villosus*, and the little suckling rootlets which it throws out for its parasitic purposes are shown by our artist on the Dodder stem just above Fig. 4. It is not particular what kind of plant it attaches itself to; but the seed of each species requires its own special conditions for germination, some liking the full light and dry soil, and others rather damp soil and some shade; and in this latter class our

present species is found. In ancient times when these facts were not known it was supposed that the separate species of this parasitic plant had special likings for separate victim plants, and hence in the writings of those Latin and Greek authors whose writings have come down to us from periods coeval with the Christian era, and to whom some species were known, we have one called the *Epithymum*, meaning the one which grew on the thyme; or the *Epilinum*, that which grew on flax. Salmon, an herbalist of the time of the English Queen Anne, gives an account of twenty-two Greek names, supposed to belong to as many species, and all these names derived from the plants on which the parasite was found. This very old author details his experiments in raising them from seed, and asserts that after the young plants have grown a little length from the seed they speedily die, unless they find something to cling to, and which more recent authors give as a modern discovery. It is a new illustration of the old truth that "there is nothing new under the sun."

At one time it was supposed that these curious plants partook somewhat of the character of the species on which they fed. Salmon, above referred to, says: "The Qualities and Properties of this Herb much follows those of the Plants upon which it grows;" and even Linnæus in his "*Materia Medica*" says of the infusion of that which grows on the thyme, that it has an odor of that herb. A curious old herbalist, Culpeper, who flourished in times when people took medicine according to the astronomical signs in the old almanacs, declares that this plant is useful for those diseases which are under the control of Saturn, but as in this case to use his language "Old Saturn is wise enough to have two strings to his bow," growing it as well from the earth where its root is, as on plants it attaches to, physicians must look to the nature of the disease, as well as to the "hot plants" or the "cold plants" on which it feeds. The moderns do not concede that the nature of the victim plant has any influence on the essential properties of the parasite; and,

as it has no leaves of its own, it shows that the power of individualization in species reposes in the cellular structure of the plant. While referring to the ideas of the ancient herbalist about the relation of the plant to diseases, it may be remarked that one of the most recent and most careful of modern authors, Dr. F. Peyre Porcher, merely says that "it is said to be laxative and hydragogue," and "it imparts a yellow dye to cloth."

The common name Dodder is said to be the ancient Frisian word, and to signify a tangled hank of silk, which the stalks often suggest.

It was at one time supposed that there were but two species of *Cuscuta*—one European and one American, and in earlier works we have to look for our plant as *Cuscuta Americana;* but Dr. George Engelmann has shown that there are numerous species in our country. The present one is probably the form noticed in the "Flora Virginica" of Gronovius, and has been named in his honor *Cuscuta Gronovii.* It is the most common of American species. Dr. Gray notes in his "Synoptical Flora of the United States," that it is found from Canada to Florida, and, in some of its forms, extends across the Rocky Mountains to the Pacific coast.

EXPLANATIONS OF THE PLATE.—1, 1. White and colored forms of the same species. 2, 2, 2. Varying forms of the flower at different stages of growth. 3. Representation of the umbonate apex of the capsule with its irregular-sized pistils. 4. Stem showing the points of close attachment to the victim plant.

BOTRYCHIUM VIRGINIANUM.

L. PRANG & COMPANY, BOSTON.

BOTRYCHIUM VIRGINIANUM.

RATTLE-SNAKE GRAPE-FERN.

NATURAL ORDER, FILICES.

BOTRYCHIUM VIRGINIANUM, Swartz.—Somewhat hairy. Sterile division of the frond about the middle of the stipe, ternately divided to the base, sessile, the divisions four to six inches long, broad-ovate, or somewhat deltoid in their outline, bipinnatifid, green; pinnæ one to two inches long, deeply pinnatifid, the lobes cuneate-oblong, incisely dentate at the apex. Fertile portion on an erect stipe nine to eighteen inches high, in a reddish-tawny compound spike two to five inches in length. (Darlington's *Flora Cestrica*. See also Gray's *Manual of the Botany of the Northern United States*, Chapman's *Flora of the Southern United States*, Wood's *Class-Book of Botany*, Eaton's *Ferns of North America*, and Williamson's *Ferns of Kentucky*.)

HE leading description has been taken from Darlington's "Flora Cestrica," chiefly because the drawing is from a Pennsylvania specimen, and further because it may serve to illustrate how far the knowledge of the origin of the various parts of a plant's structure has progressed since Dr. Darlington's time. The work from which we quote was published in 1853, and at that time it was by no means widely known that every part of a plant's structure was formed in its earliest stages out of what might be leaves. This knowledge, however, has to be wholly inferred from results; for the most powerful microscope has failed to discover this early individual leaf-form in any particular plant, before it takes on the peculiarities by which we are able to distinguish one part from another. At the time of which we write this science, known as Morphology, was comparatively new, and Dr. Darlington, as we may judge from some of his writings at that time, was a believer in its doctrines; but we can see by the way the description is written, though it accurately describes our plant, he did not understand the full import of morphology in de-

scriptive botany. He looks upon the stipe as a simple structure, which finally divides, the division taking place about the middle of the frond. But instead of being a simple structure, we know that in its origin it is compound. The fertile portion is one whole frond, having primarily a separate stipe which has been clasped by the stipe of the barren frond, and the two have grown so closely together, that to all appearances, and quite accurately enough for botanical description, it appears as one simple stipe, out of which the barren frond seems to grow. In this species the whole stipe of the barren portion has united with the other, and this is the reason why it seems sessile, or without any leaf stalk; but in other species it is only partially united, and then the frond seems stalked; or again it is wholly free, and there are two distinct stipes, as the petioles of ferns are called, and it is from these comparisons that we learn how much the early union or early freedom of parts has to do with final results in form. In earlier times, before this knowledge was gained, the divisions of the leaves were deemed important characters; but while leaf-divisions involve the question of an union or freedom of parts, they are parts that in their final development are still leaf-blade, and are of less consequence than the changes which occur in the earlier stages of plant life. Hence, if the five divisions of the frond were to be found united, so as to make one uniform surface, the collector might reasonably suspect he had but a form of *Botrychium Virginianum;* but if he were to find one as finely divided as this, but with the fruiting stalk more widely separate from the barren stalk, he would be much more likely to have another species.

Our morphological lesson may be carried further, so as to show how the fruit is formed out of leaves or leafy substances. The fertile frond was, in early life, precisely the same as the barren one; but the power of union was greater in one than the other, and the final divisions in the barren frond (a, a, in Fig. 1) have been rolled up to form the spore cases (a, a, in Fig. 3). There is no reason, therefore, in the nature of things, why sometimes green leafy blades may not appear on weak fertile fronds, and

round fruit-case among the green blades on a stronger barren one. Instances of the former, however, are not on record; but it is not rare to find the latter. The writer has seen a few specimens, and others have been noted in botanical works. In the 3d volume of the *American Naturalist*, Mr. Henry Gilman notes a very remarkable case, wherein not merely some of the divisions of the barren frond became fertile, but another fertile frond came out of the main stalk of the barren one, indicating the probability from the morphological laws pointed out already, that three primordial fronds had been rolled up together instead of the usual two.

Though the fertile frond has not been known to vary so as to have some segments frondose, it has been known to vary in form. In our illustration (Fig. 2), we see the main divisions correspond nearly with those in the barren one. But in the 1st volume of the *Botanical Gazette*, Mr. I. C. Martindale and Mr. Davenport note that sometimes the upper portion is suppressed, and the lower divisions lengthened, making all the fruit-bearing stalks of nearly equal length.

The English name, "Grape Fern," is merely a translation of its Latin name, *Botrychium*, referring to its grape-like fruit. "Rattle-snake," as applied to this particular species, seems to have been first noted by Clayton, the early Virginia collector, who, when sending his specimens to Gronovius, in Europe, remarked that it was "Rattle snake-root Fern." This would seem to indicate an impression that it had something in common with other "snake roots" as a curer of snake bites; but no subsequent author makes any such reference, and it is more probable that the name was suggested by the resemblance of the spore cases to the tail of a rattle-snake. In regard to its medical qualities, Rafinesque says it is but a mild astringent.

This fern is very much admired, and deservedly so, for there are few which can offer more real elements of beauty. The ideal which connects a large number of weak individuals with the strength of a few supporting ones, is always pleasing; and we

have this beautiful ideal remarkably well illustrated in the fern before us. The innumerable little thin and delicate leaflets on the strong stipe and main divisions of the frond have a singularly harmonious effect. For some reason, which we have never seen analyzed in treatises on the theory of beauty, the mind loves to trace resemblances in what it sees to pictures already stored away. In this respect the Rattle-snake Grape-fern is conspicuous. In old times, before plants had a specific as well as a generic name, writers referred to it chiefly in connection with these resemblances. Plumier wrote of it as "the *Osmunda*, with the roots like an Asphodel;" Clayton "the *Lunaria*, with the leaves of a *Matricaria;*" and in more modern times Hooker and Baker—"the leaf in its cutting resembles *Anthriscus sylvestris.*" The Latin specific names are also full of these suggestions. Thus it has been called *Botrychium cicutarium*, and *Botrychium anthemoides*,—all these names from the resemblance to chamomile, parsley or others among umbelliferous or composite plants.

Outside of these more popular reflections, the critical botanist will find the buds at the base of the stipes interesting, and Eaton remarks that "the epidermis is composed of cellules with sinuous margins." Its delicate fronds turn yellow in the fall, and wholly disappear before winter sets in.

In its geographical relations it is remarkable for the extent of territory it covers. It is found as far south as Brazil, and sweeps up through the eastern United States as far west as Texas, Arkansas, Colorado and Kansas, extending then more westwardly to Oregon, crossing to Asia, into Japan, and being found in some of its forms in Northern Europe. It is, in all probability, one of the oldest inhabitants of the globe, and has exhibited a tenacity in holding its own through the ages that is very remarkable.

EXPLANATIONS OF THE PLATE.—1. A full-sized stipe, with barren and fertile frond. 2. Fertile frond. 3. Enlarged sporangia, showing the transverse openings and their relation at a, a, to the divisions of the frond.

WYETHIA ARIZONICA.

L. PRANG & COMPANY, BOSTON.

WYETHIA ARIZONICA.

ARIZONIAN WYETHIA.

NATURAL ORDER, COMPOSITÆ.

WYETHIA ARIZONICA, Gray.—One foot high, scabrous-hirsute; one to two flowered; leaves oblong-lanceolate, very entire, superior ones sessile; heads small, involucre hemispherical, scales oblong, or ovate-lanceolate, (those I have seen erect,) hirsute with short gray hair; corolla teeth, somewhat hispid externally; ray florets about ten, (nearly an inch.) (Asa Gray in *Proceedings of the American Academy of Arts and Sciences*, vol. 8, p. 655.)

ONE who is familiar only with the wild plants of the Eastern, or, rather, the Atlantic States of the Union, or even with the vegetation of the Pacific coast, can have no idea of the unique character of the forms he may meet with in the interior portions of the continent. It seems to have a vegetation peculiar to itself. He may now and then meet with some familiar feature, but there are a large number that have characters essentially novel, and, indeed, whole families that are found in these wild places and nowhere else. This is particularly the case with the vegetation of the mountain region in Utah; for here a class of plants appears that have little relation with the flora of the older settled States, and whose allies would probably be found, if at all, in the warmer and dryer regions of more southern countries. Even the scenery itself is peculiar, and the very winds seem to tell of another land. The writer of this, as he has stood among these wonderfully beautiful Utah mountains and admired the curious flowers growing among them, could well exclaim with Bryant:

"Breezes of the South!
Who toss the golden and the flame-like flowers,

> And pass the prairie hawk that, poised on high,
> Flaps his broad wings, yet moves not—ye have played
> Among the palms of Mexico and vines
> Of Texas, and have crisped the limpid brooks
> That from the fountains of Sonora glide
> Into the calm Pacific—have ye found
> A nobler or a lovelier scene than this?"

It was in a "scene like this," in the lower regions of the Wahsatch mountains, that the writer first saw what he believes to have been the "golden and flame-like flowers" of this beautiful Utah plant. Some of the stout roots were dug with his botanical trowel, and so sure was he of getting them to grow that no specimens were secured for the herbarium, but unfortunately they did not live. Subsequently, on the writer's return, Mr. A. L. Siler, of Kane county, Utah, was applied to, who in time furnished seeds, and from them plants flowered in the writer's garden, in 1878, which perhaps were the first living plants in the East, and from these our drawing was made. When it flowered it proved to be the *Wyethia Arizonica*, which had been described under this name by Dr. Gray, a few years before, from specimens collected in Arizona by Dr. Palmer. Dr. Gray also credits Captain F. M. Bishop with finding it in southern Utah, and Mr. Siler must share the credit of the early discovery with these deserving names.

We may learn from this account how unsafe it is to depend on a plant's name for much knowledge. No species had been found in Arizona before Dr. Palmer discovered this; others, previously known, grew more northerly. It was named from its location, but we see it has already been received from Utah; and though this but partially robs the name of peculiarity, the finding of another species in Arizona, a not unlikely occurrence, would take the meaning entirely away.

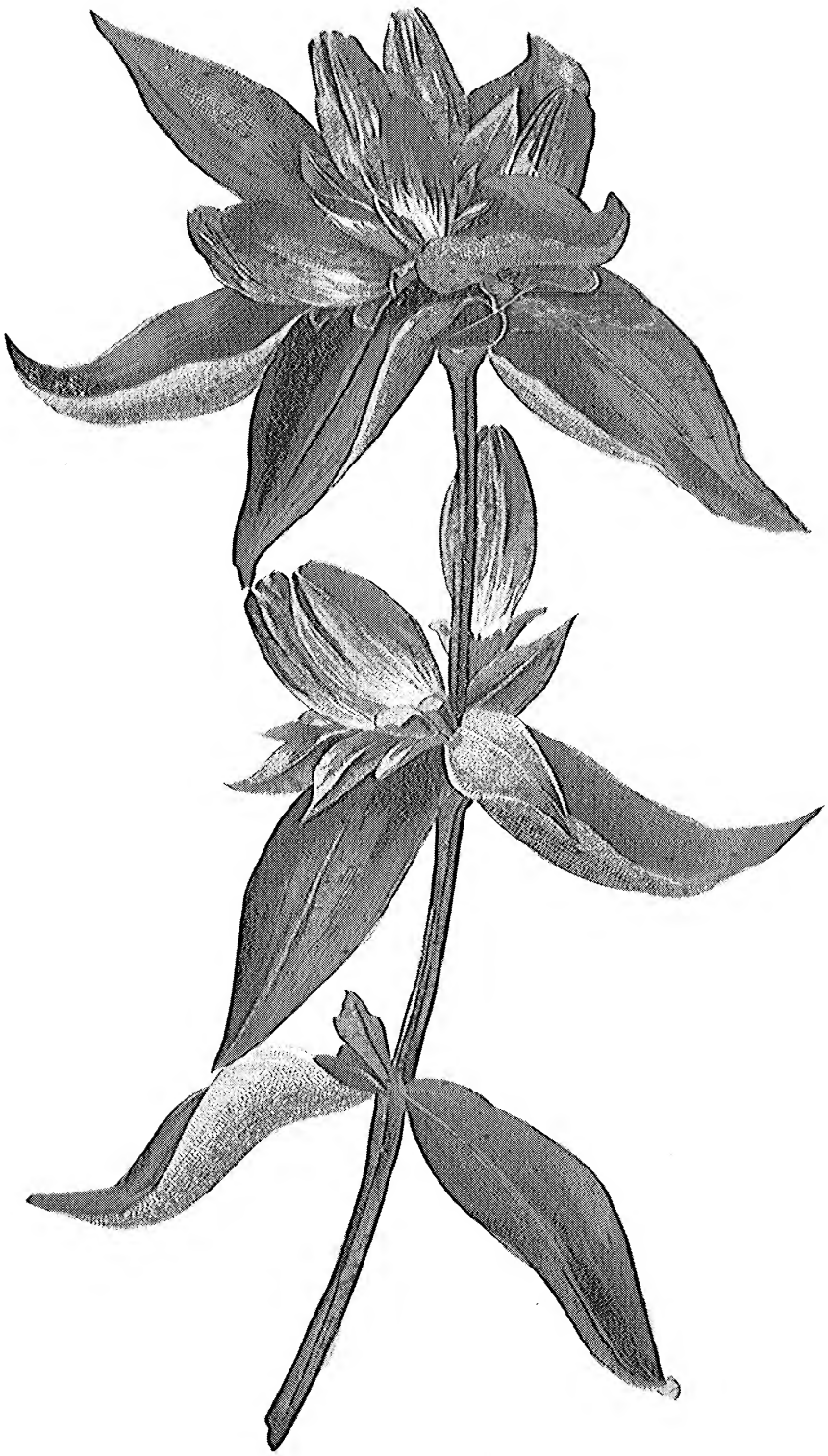
As already noted, other species of *Wyethia* exist, but the first one was only found in 1834, and the circumstances connected with its discovery are so interesting that we are tempted to enlarge on them. People in these times often wonder how it was

before the days of railroads and steamboats, when the whole interior of our continent was given up to savages and wild beasts, and was for thousands of miles a trackless wilderness, that men could be found to push through from the Atlantic to the Pacific in search of plants, no matter how great their love or enthusiasm for nature might be. But they were only able to do it by taking advantage of every opportunity that promised safety. In the case of the discovery of the *Wyethia* a party of individuals in New York and Boston formed themselves into a company with the object of establishing fishing, hunting and trading posts along the line from the Rocky Mountains to the Columbia River, on the Pacific; and resolved on sending an armed expedition across the continent for this purpose. Thomas Nuttall, the botanist, then in Philadelphia, desired to join this company in order to get the chance to collect plants; and he was, in company with Mr. Townsend, another member of the Philadelphia Academy of Natural Sciences, permitted to do so. They started by wagons across Pennsylvania to Pittsburg, and from thence took a boat and went down the Ohio to St. Louis, where they arrived on the 24th of March, 1834, after this long winter voyage, in time to go with the party. The expedition was commanded by Captain N. B. Wyeth, who also had a pecuniary interest in the trading company. Mr. Townsend tells us of the enthusiasm of Mr. Nuttall for his favorite pursuit, and which was, in a measure, communicated to all the party, so that on one occasion, when the flowers were more than usually lovely, the whole party "shouted 'beautiful! beautiful!' and Mr. Nuttall was here in his glory. He rode far ahead of the company and cleared the passages with a trembling and eager hand, looking anxiously back at the approaching party, as though he feared it would come and tread his lovely prizes under foot. From this time Mr. Nuttall found dozens of new species almost daily." After an immense amount of hardship and suffering they arrived at their destination, and Mr. Nuttall left the party to pursue his botanical investigations in the Sandwich Islands and California.

But it was not on this part of the journey that the *Wyethia* was discovered, but on the return trip to the Missouri of Wyeth's party. Knowing nothing of botany, yet Mr. Nuttall's love of collecting had so impressed Wyeth that he determined to collect himself, and this was among the lot he found. Mr. Nuttall subsequently described it in the "Journal of the Academy of Natural Sciences of Philadelphia" as *Wyethia helianthoides*. The location given was the "Kansas plains, near the Flat Head River, towards the sources of the Oregon." Since that time nine other species have been found, and there may probably be more by the time the interior of our country has been fully explored.

The first impression of the collector would be to compare it with the sun-flower—*Helianthus*—and this evidently was Mr. Nuttall's idea in the name of his first species—*W. helianthoides;* but a critical examination of the flowers will show the distinction. The tube of the disc corolla (see Fig. 4) is campanulate, and with very little constriction at the point of union with the achene.

Since the above was written, Dr. Rothrock's "Botany of the Wheeler Survey of the One Hundredth Meridian" has appeared, in which is a good plain drawing and description of the plant, which was found by the collectors at Willow Spring, Arizona. There are some little differences between the plant found here and the description adopted at the head of our chapter. Rothrock found the plant two or three feet high, and from two to four flowered, and the flowers are rather large instead of "small." There are also some slight differences in the details of the flowers. It is well to call attention to these little differences as showing the student that he must rarely expect to find a plant in any species to agree exactly with a description in every little particular. Variation, as a law of nature, pervades the individuals of a species, as well as gives the character to species itself.



GENTIANA ANDREWSII.

L. PRANG & COMPANY, BOSTON.

GENTIANA ANDREWSII.

CLOSED GENTIAN.

NATURAL ORDER, GENTIANACEÆ.

GENTIANA ANDREWSII, Grisebach.—Stems stout, a foot or two high, smooth: leaves from ovate to broadly lanceolate, gradually acuminate, contracted at the base, two to four inches long: calyx-lobes lanceolate to ovate, usually spreading or recurved, shorter than the tube: corolla as in Gentiana Saponaria, but more oblong, and the lobes obliterated or obsolete, the truncate and usually closed border mainly consisting of the prominent fimbriate-dentate intervening appendages: seeds with a conspicuous wing, oblong in outline. (Gray's *Synoptical Flora of North America.* See also Gray's *Flora of the Northern United States*, Chapman's *Flora of the Southern United States*, and Wood's *Class-Book of Botany.*)

THERE are but few persons who have been observers of flowers in the temperate regions of the world who do not know the Gentian, for most of the family have very attractive characters which thrust themselves on our attention, whether we will or no. Modern botanists enumerate about one hundred and fifty species; but the limits of the genus are not capable of a very exact definition, and hence some botanists might give even a larger list than this. They are chiefly Alpine, and very few are found in low altitudes, but of these our present subject is one. According to Dr. Gray, from whom we have the botanical description at the head of our chapter, it is found "in moist ground, New England and Canada to Saskatchewan, and south to the upper part of Georgia." It is generally known as the "closed Gentian," because, though most of the species open under sunlight, and close at certain times, this one rarely does. The rapid manner in which some species open and shut is very interesting. The writer has seen species on Alpine heights, which

were open under a warm sun, close in a few minutes when visited by a sudden snow-storm; and again open as rapidly when the sun came out and turned to water the fallen snow. It is, indeed, remarkable that this one species should resist this solar influence. Of course, its time of blooming is not favorable to its being caught in a snow-storm in spring. As Bryant has said of another species of Gentian:

> "Thou comest not when violets lean
> O'er wandering brooks and springs unseen,
> Or columbines, in purple drest,
> Nod o'er the ground-birds' hidden nest."

But it appears in September, when other flowers are bethinking of going to their wintry rest. In Pennsylvania, from whence the specimen illustrated was taken, it is one of the latest fall-flowers that are found in open grassy places. It seldom grows here in any one spot in quantity sufficient to give a marked character to the autumnal scenery, and yet it is sufficiently abundant to prevent its being overlooked wherever it exists at all. Its beauty has attracted the attention of florists; and it is often met with under culture, where it seems to thrive very well without any special care, and to prefer much drier and more open places than those in which it is naturally found. In England it seems to be as well appreciated as here. Mr. Robinson, in his work on "Alpine Flowers," tells us it is regarded as more beautiful than *Gentiana Saponaria*, and more worthy of culture.

Botanically, it was confused with *G. Saponaria*, or allied species, by the earlier botanists. Rafinesque, in his "Medical Flora," published in 1818, seems to have been the first to note its true distinction, and named it *Gentiana clausa*—literally, the "closed Gentian;" and it would seem, under the law of priority, that this should be its prevailing name. But Professor Gray, and American botanists generally, follow Grisebach, who, in 1843, wrote a monograph of the order, in which he gave it the name of *Gentiana Andrewsii*, in honor of Henry Andrews, who edited the "Botanical Repository," an illustrated work, published in London

at the incoming of the present century, and who figured this plant, supposing it to be a species already named. It differs from *Gentiana Saponaria*, as pointed out by Dr. Hooker, in not having the linear or spatulate calyx-lobes of that species, which in that one equal or exceed the tube. *G. Saponaria* has also a light blue corolla with distinct lobes and cleft appendages, and acute narrowly winged seeds. The generic name, Gentian, is a very old one, occurring in the writings of Pliny, the ancient Roman writer, and is supposed to have been derived from Gentius, a King of Illyria, who discovered tonic virtues in a species now believed to be *Gentiana lutea*, of the old world, and by the use of which he arrested malarial fever which had prevailed in his army. Many of these ancient remedies have not sustained their reputations in these later times, but Gentian is still very popular in modern pharmacy. Its bitter principle has much relation to hops; and it was used as hops before the latter came into such general use. It is still a popular ingredient in many patent medicines, especially such as are known as "Stomachics" and "Bitters."

Besides the interest connected with the historical family relations, and its own merits as a beautiful wild flower, and also one well adapted to garden culture, the closed Gentian contributes its share to philosophical botany and furnishes some facts which are valued in modern biological speculations. As already noted, most Gentians open under sunlight, while this remains closed at nearly all times; and what particular purpose such behavior serves in the economy of the plant-life is the problem. It is believed that plants are generally benefited by an occasional cross through the pollen of some other flower; but, of course, if this never opens, it must be a self-fertilizer, and thus be deprived of the benefits of any of this intermixture with other individuals. In the "American Naturalist," for 1874, Professor Gray notes that in the closed blossoms the flowers are all erect, with the two stigmas considerably above the five anthers. He has seen bumble-bees force their way into the corollas, and he believes that the flowers can only be fertilized by insect agency. In the volume

for 1875, Mr. M. W. Vansenburg shows that the stigmas are at first below the mature polleniferous anthers, and that the pistil, as it grows, pushes the stigmata through the mass, and are thus self-fertilized and not by insect aid. In the "Bulletin of the Torrey Botanical Club," for 1877, Dr. Kunze confirms Mr. Vansenburg's observations about the growth of the pistil, and he concludes that the flowers are truly cleistogene and derive no aid from insects. At p. 179, following in the same volume, Professor Gray says at Cambridge the "corolla opens like other Gentians;" and because of the conspicuous and high-colored flowers, and other reasons, concludes that they must be designed for cross-fertilization. In a succeeding volume, another observer offers some reasons for concluding that the plant may behave differently in different localities; but this summary of what leading botanists believe shows how much there is yet to be positively ascertained in relation to this beautiful wild flower.

The colors vary with the situation in which the plants grow. In partial shade, under which they are sometimes found, the flowers have much more blue in them than when in more exposed places. The specimen we have chosen for illustration was growing in an unusually open place. In such cases there is a brownish tendency with the purple.

ASTER PATENS

L. PRANG & COMPANY, BOSTON.

ASTER PATENS.

SPREADING ASTER.

NATURAL ORDER, COMPOSITÆ.

ASTER PATENS, Aiton.—Stem eighteen inches to two or three feet high, slender, roughish-pubescent, branched above,—the branches often elongated, spreading, and clothed with minute bract-like leaves. Leaves half an inch to two or three inches long, scabrous and serrulate-ciliate, clasping and auriculate at the base. Heads of flowers about medium size (larger in the variety *phlogifolius*), sub-solitary on the slender branches, rays bluish-purple; involucre minutely scabrous; akenes silky-pilose. (Darlington's *Flora Cestrica*. See also Gray's *Manual of the Botany of the Northern United States*, Chapman's *Flora of the Southern United States*, and Wood's *Class-Book of Botany*.)

THE common name of the plants comprising this well-known genus is Star-wort, which is a translation of the ancient Greek name *aster*, signifying a Star; and so named because of the ray petals of the compound flower giving the head somewhat the appearance of a star. But the plants known as Aster to the ancients were a very heterogeneous set, as must needs be when the laws of true affinity were but imperfectly known; and some of them have been removed to other genera by authors who have lived nearer our own time. The *Aster* of Dioscorides is probably the plant now known as *Inula Bubonium*, and more closely related to the common Elecampane than to anything we should regard as an *Aster* now. The *Aster* of Pliny, the well-known Roman writer, was probably the plant still known as *Aster Amellus*, and which grows in Italy, Sicily, and abundantly about Athens in Greece. But though the name Star-wort in its origin is so ancient, so many plants have flowers that have been likened to stars, and by the people named accordingly, that it is as well that the easy name Aster has come into common use,

and that modern botanists have generally dropped the name of Star-wort.

Our knowledge of the true Asters has increased wonderfully during the past century. Linnæus, in his first great work, "Hortus Cliffortianus," in 1737, describes only nineteen species. Willdenow, in his "Species Plantarum," has one hundred and three. Decandolle, in 1836, described one hundred and fifty, after placing a number of Willdenow's species in other genera. Since that time, by the labors of botanists in America, Australia and elsewhere, the number known is over two hundred, the greater proportion of them being natives of the American continent. The list is still increasing, and scarce an expedition of any consequence explores the comparatively unknown portions of the country without adding a new Aster to our list of native flowers. There are few genera of plants better known to the people generally than Aster, and it is not uncommon for the whole of the very large natural order of *Compositæ* to be referred to as the *Asteraceous* one.

At first sight, all asteraceous plants seem to have a general resemblance, and, therefore, the order seems one difficult to study; but with a good pocket lens to examine the inflorescence carefully, the family soon becomes an enticing one to the student. Now every one understands that what is known as the head in a composite plant is really made up of innumerable small flowers. Sometimes these flowers are few in a head, say less than ten; but to be an *Aster* there must be more than this number. Then some composites have all the florets alike, but an *Aster* must have the outside or ray florets strap-shaped, and the inside or disc flowers tubular; and besides, these strap-shaped outside florets must be fertile, while in other genera they may be barren. The scales of the involucre, or the little green processes embracing the flowers, are often in one single row; but in an *Aster* there must be several rows, and they must lap over one another like tiles on a roof. Then again, in some compound flowers the part which bears the little flowers, the receptacle, is elevated, or

cone-like; but the receptacle of an *Aster* is flat and pitted with little holes. The seed, or akene, is more or less flattened; and the pappus, which, in so many flowers of the order, give the seed a sort of downy crown, in *Aster* is but in a single row and composed of slender bristles. When the student has all of these characters in one single head, he has most likely happened on an *Aster;* and it is by similar easy combinations of characters that any genus of asteraceous plants may be easily traced.

In determining the species, the leaves, involucre, petals and general habit have to be taken also collectively. With close attention to these and some other points *Asters* are not more difficult of study than other plants. In the species native to the eastern United States, Dr. Gray pays attention first to the root leaves. Some have these heart-shaped; others not. As we see in Fig. 1, our plant belongs to the last section. Then there are some which have the lower leaves not heart-shaped, but have the upper leaves somewhat of this character, and here we find our plant. In this section he has but three species, of which two are described as very smooth, and the other rough-pubescent. This latter character suits our plant,—but hairiness or smoothness is a rather variable character in plants, and it will not be safe to rely on this alone in the leaves and stems; but we see the akene (in Fig. 4) is silky, and this character is more constant in this part and is of more value in deciding the species. The manner in which the flowers are produced on the stem is always of importance in an *Aster*. At times the terminal flowers are on shortened stalks, while the lower ones are lengthened, giving the whole mass of flowers a sort of umbrella-like or corymbose appearance; while others have shortened side branches, producing a racemed or spike-like character. Our species is intermediate in this respect. Sometimes the lateral branches are short, making a slender panicle; at other times they are on slender branchlets from two to six inches in length, which push out horizontally and at right angles with the main stem; and it is from this "patent" or spreading character of these branchlets that the

plant derives its specific name. It is generally more or less few-flowered in comparison with other Asters; but when, in this much-branched condition, a dozen or more flowers may often be found expanded at once, it gives a conoid bunch of flowers very beautiful indeed. It usually grows in large quantities together; and though the slender stem and few flowers of the single branch does not make much show by itself, together the plants make a very effective feature in our beautiful autumn scenery. In the location from whence our specimen was taken for illustration—the Wissahickon Valley, near Philadelphia—it seems to delight in the partial shade of trees or low shrubs in rather cool situations. Authors differ as to its habits in this respect. Lesquereux says it is found in shady woods and sandy prairies in Arkansas; Dr. Gray says "dry ground;" and Willis reports it as common in dry soil in New Jersey. Prof. Wood's experience is that it is found in moist ground, and with this Dr. Darlington agrees, he giving "moist woodlands" as its habitat in Chester county, Pennsylvania. This last is perhaps its most desirable location, as it has not proved a very great success when removed to open sunny borders for cultivation.

In polite literature the Aster has an honored place, and is an especial favorite with American poets. A fair-sized volume might be formed of the many pretty things they have said of them. Many of these are well known. Earl Marble has some pretty lines, not so often quoted, from which we may take the following:

"O, aster-blooms! ye cluster so
In quaint fence-corners, and in rifts
Of hedges, that a dream of snow
Ye seem; soft, dainty drifts
Of shining snow, from distance viewed;
Of snow that soon shall gather there,
When winds shall grow more stern and rude,
And skies in azure tints less fair."

EXPLANATIONS OF THE PLATE.—1. Root leaves from a stock to flower next year. 2. Terminal flowers from an average-sized branch. 3. Section from central portion of a branch. 4. Flower with silky akene, and its pappus.

ASPIDIUM CRISTATUM

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ASPIDIUM CRISTATUM.

CRESTED SHIELD-FERN.

NATURAL ORDER, FILICES.

ASPIDIUM CRISTATUM, Swartz.—Frond linear-oblong or lanceolate in outline, one to two feet long; pinnæ short, two to three inches long, triangular-oblong, or the lowest nearly triangular-ovate, from a somewhat heart-shaped base, acute, deeply pinnatifid; the divisions (six to ten pairs) oblong, very obtuse, finely serrate or cut-toothed, the lowest pinnatifid-lobed; fruit dots as near the mid-vein as the margin; indusium round-reniform, the sinus mostly shallow, smooth and naked. Stipes and the stout creeping root-stock bearing broad and deciduous chaffy scales. (Gray's *Manual of the Botany of the Northern United States.* See also Wood's *Class-Book of Botany*, and Williamson's *Ferns of Kentucky.*)

THERE are few pleasures more agreeable to the botanist than the discovery of a new species, or of a new location for an old one. Botanical students are now so abundant that few new plants are to be found in the older settled portions of our country; but new locations for the rarer species are frequently discovered, and these occasionally in places wholly unexpected. In Philadelphia, now numbering a population of nearly a million, there are hundreds of botanists who are continually collecting the plants growing within ten or fifteen miles about it; but it is nowhere on record that any one has found within this limit the pretty fern we now describe. The earlier and famous botanists made special explorations of this district, and one of them, Dr. W. C. P. Barton, in 1818, published a "Compendium Floræ Philadelphicæ," or a description of the indigenous and naturalized plants found within a circuit of ten miles round Philadelphia; but there is no note of any one having found this species within this limit. It was therefore a great satisfaction to the brother of the writer of this, Mr. Joseph Meehan, when he found a few

plants of the species, not half a mile from where the celebrated and sharp-eyed botanist, Thomas Nuttall, often made his home, and on ground over which the writer had often collected plants. This was the more surprising when on a subsequent examination a good number of specimens were found in the vicinity, from whence one was taken to furnish the illustration given here. The incident is of value as showing to the collector that he may not regard his work as completed, though he may be tempted to believe that he has found everything in a certain district. Repeated examinations may result in finding something he has never seen there before.

This—the Crested Fern—may be found quite late in the season, long after the flowers are gone, and indeed after many of the ferny race have wholly withered away. It was late in November when the writer made his first acquaintance with a living plant. We had searched in vain for it through a piece of hilly woods, where the golden-rods and asters floated away their filmy-crowned seeds with every step we took. As we descended to lower ground the withered remains of the Cinnamon Fern, the Lady Fern, and the Rattlesnake Grape-Fern could hardly be distinguished from the brown oak and other forest leaves that thickly strewed the ground. There was no sign of living green anywhere till we came to a small swamp in which were growing numerous fine specimens of the Swamp Alder and Poison Ash, over which grape vines and round-leaved Smilax made an immense bower, through which the sunlight glimmered, showing numerous buds of the skunk-cabbage already at the surface of the ground, awaiting the earliest breath of spring to fan it into life. Through this thicket a little stream meandered, its sides covered with *Hypnum*, *Bryum*, and other mosses, and springing up among them just one plant of the Crested Fern, which we had started out to find. The enthusiastic plant-collector may not perhaps endow his floral treasures with an actual personality, but yet they seem to talk with him, and tell him stories of the past, or remind him of something that has gone before; and the dis-

covery of this single plant in its mossy seat, in this pretty autumn day, reminded one so much of the solitary Indian in Whittier's legendary story of the "Fountain," that it will not be out of place to quote the lines here:

"With the oak its shadow throwing
O'er his mossy seat,
And the cool, sweet waters flowing
Softly at his feet,
Closely by the fountain's rim
That lone Indian seated him.

"Autumn's earliest frost had given
To the woods below
Hues of beauty, such as heaven
Lendeth to its bow;
And the soft breeze from the west
Scarcely broke their dreamy rest."

As in the case with many an Indian, however, the loneliness was more apparent than real, for on another occasion, and not very far away, we found others, but always in low and somewhat inaccessible swamps, partially shaded by trees; and from the reports of various authors it is in just such situations that those who would seek may find. The fronds in the strongest cases under observation were about two feet high. The specimens illustrated are about the fair average, except that the stipe is about one-third the length of the foliaceous portion, which in our illustration had to be shortened to suit the size of the plate. The fruit dots appear on the upper portions of the strongest fronds, and it is remarkable that these fertile portions die first; the barren portions remain green until early winter, and the smaller of the barren ones continuing green till the new ones push in spring.

The species varies much in different locations, but chiefly in the lobing of the pinnules. In all the specimens from Pennsylvania and Delaware the author has examined, the lowest and barren pinnules are the only ones that are pinnatifid, the upper ones being simply crenate. In these cases the fruit dots are arranged so as to have one to each little division, and about midway

between the end of the division and the mid-vein. As we get further north we find the fertile fronds deeply pinnatifid; and in such cases the fruit dots form a line alongside the mid-rib of the ultimate divisions. Our Fig. 2, drawn from a dried specimen from New England, exhibits this character. Other botanists have noted that the fruit dots are sometimes nearer to the mid-vein than to the margin, and in other cases the reverse, but in the typical form they are about midway. Again in the more northern specimen, Fig. 2, we see that the upper portion of the fertile divisions are very coarsely toothed. It is probably from these coarse segments that the species derived the name *cristatum*, or crested, a character nearly wanting in the form illustrated.

The Crested Fern is a native of the north of Europe as well as of the United States, and has been known from the time of Linnæus, who named it *Polypodium cristatum*, the genus *Aspidium* not having been founded till Swartz established it in 1800. Since that time succeeding botanists have endeavored to make other genera out of *Aspidium*, and have carried our Crested Fern into their several classifications. Thus we find it in some works referred to as *Lastræa cristata*, *Nephrodium cristatum*, *Polystichum cristatum*, and *Dryopteris cristata*. It is worthy of note that Professor Asa Gray, who in the earlier editions of his "Manual" gave it the last name, has abandoned it in the later one from whence our description was taken; and this shows how nice and how imperfectly understood are the natural limits which divide the genera of ferns. Considering Chapman's *Aspidium Floridanum* to be only the Crested Shield-Fern, we find it along the seaboard Atlantic States, barely reaching Kentucky and Ohio westwardly, and becoming more common as it goes northward to Canada. It is sparingly found in England, but becomes more abundant as it approaches eastwardly the American continent.

EXPLANATIONS OF THE PLATE.—1. Fronds of Pennsylvania specimens, with the stipes shortened. 2. Northern form with crested lobes, from a dried specimen

CALOCHORTUS VENUSTUS.

L. PRANG & COMPANY, BOSTON.

CALOCHORTUS VENUSTUS.

MARIPOSA LILY; BUTTER-FLY TULIP.

NATURAL ORDER, LILIACEÆ.

CALOCHORTUS VENUSTUS, Bentham.—Resembles CALOCHORTUS LUTEUS: petals white or pale lilac, with a more or less conspicuous reddish spot at top, a brownish-yellow-bordered centre, and a brownish base; gland large, oblong, usually densely hairy, and surrounded by scattered hairs: capsule one to two and a half inches long. (Sereno Watson in *Proceedings of the American Academy of Arts and Sciences*, 1879. See also Alphonso Wood in *Proceedings of Academy of Natural Sciences*, of Philadelphia, 1868.)

PURSH, in his "Flora of North America," published in 1814, gave us the first knowledge of this beautiful genus of plants. In the preface he speaks of it as "a bulbous rush;" and in the body of the work it is described as a new genus, and named by him Calochortus—from two Greek words signifying "pretty grass." It must be remembered, however, that Pursh himself was never beyond the Mississippi, where alone the species forming this genus is found; but he became possessed of the specimens collected by Lewis and Clarke, in their celebrated expedition across the continent in 1804–5, and he incorporated the result of their labors in his work. In the case of this plant he could, therefore, know it only as a dried specimen; but even in this unfavorable condition we see, by the pretty name he gave it, how much its beauty struck him. But even in its fresh and living state the species he described was not equal in beauty to the one we now illustrate, which was discovered in southern California by David Douglas, the collector to the Royal Horticultural Society of London, who sent seeds of it to that body, which were raised in their garden about 1832, and described in

the Transactions of the society a few years after by Mr. Bentham under the name of *Calochortus venustus*,—that is to say, literally, the Calochortus which is as charming as Venus—the beautiful Calochortus. Many other species were discovered by Douglas and some have been added to the list since that time by subsequent explorers, till the list of known species, according to Mr. Watson's recent enumeration, now embraces thirty-two species; but not one of them has been able to dispute with this, the exclusive right to its specific name. It adds to its beauty the charm of variety, for no two of them are exactly alike in form or color. The three flowers on our plate are from three separate roots, given by Mr. Theodore Schuster of Brooklyn, New York, who received them from Verada county, California. These three, as we see, differ from one another. The lower one is nearly white in its ground color, and the spot on the petal is nearly triangular; the petals also are loose, and barely touch one another when expanded. The upper one is purple, and the spot is broadly oval, while the colors at the base are more penciled, and with less decided limits to their lines. The other flower is smaller, the petals overlap one another, the spot is much longer than wide, and all the colors are more distinctly outlined. Among European florists some of the most distinct forms have been selected and bear separate garden names. The beauty of its flower struck the original Mexican inhabitants of California, before that piece of territory became annexed to the United States; and it is from them we have the common name "Mariposa," which is said to mean "butterfly," and the plant is commonly called Mariposa Lily, or Butterfly flower.

The plant, of course, is not a lily, though belonging to the order *Liliaceæ*, of which the true Lily is the type. It may be remembered that *Lilium* has the sepals and petals nearly alike, so that it makes what botanists call a six-parted perianth. In our plant there are but three distinct petals, though looking through the divisions of the lower flower in our plate, we see by the spot on the interior of the small sepals and some other

colors, that they are disposed to take on a true petaloid character as in Lilies; and the instance is useful as showing the student how genera are formed by suppression of parts in some instances, and their development in others. In the root we see another difference from true Lilies which have a scaly bulb, while the plant before us has a tunicated or coated one. In this respect it resembles the Tulip, from which, indeed, it differs little, except in the great difference between the size and development of petals and sepals.

The Tulip of the old world has made its mark in history and poetry. It has been taken as a type of gayety and splendor by those deep in floral emblems.

Percival writes:

> "Gay as the tulip in its starred bed glowing,
> As clouds that curtain round the west at even,
> O'er earth a canopy of glory throwing,
> And heralding the radiant path to heaven."

But if the Tulip of our gardens may be fairly suggestive of a beautiful sky in an autumn sunset, the picture may be better painted by the help of the numerous rich shades possessed by our Mariposa Lilies. Perhaps they may make as popular garden flowers and be as highly prized as the true Tulip has been, when their culture becomes fully understood; but that time has not come yet. When first introduced through Douglas, now nearly fifty years ago, the plants from the seed he sent were widely distributed, but they soon wholly disappeared. New importations of roots have been kept up continually since that time, but though the skill of English gardeners is world-renowned, it has not succeeded in keeping the roots sound but a few years. The "Gardeners' Magazine" for 1878 tells us that they are "reputably difficult to cultivate, through not taking necessary precautions;" and the "Garden" for 1876 observes that the species "rapidly disappear from English gardens." In the case of the writer of this chapter, the roots from which the drawings were made did not flower the second year, and by the

third had disappeared altogether. It is said that in their native places of growth they are always found very deep in the ground. Under culture the new bulb forms from an upper portion of the stem as noted in our drawing, and this small beginning is all that the plant depends on for its growth the next year. It may be that deep planting in light soil might prevent this stem-formation of a little bulb, or so strengthen it as to make it equal in flowering ability to its parent of the former year.

The roots of this and other species supply the Indians with a favorite article of food. As the roots are small and are found only at some depth, the Indians must possess more industry in some respects than they often get credit for. They call these roots "Sego."

Calochortus venustus is found only in southern California. A form found by Captain Gunnison in the Rocky mountains, on the Pacific Railroad explorations, was supposed by Torrey to be one of the forms of this species; but a better acquaintance with it led Mr. Watson to the knowledge that it was a distinct species, and he called it *Calochortus Gunnisonii*. The beautiful plate in Mr. Robinson's *Garden*, vol. 9, belongs to this species and not to the true *Calochortus venustus* as there stated.

HELIOPSIS LÆVIS.

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HELIOPSIS LÆVIS.

FALSE SUN-FLOWER.

NATURAL ORDER, COMPOSITÆ.

HELIOPSIS LÆVIS, Persoon.—Smooth; stem slender, branching; leaves ovate to ovate-lanceolate, acute or acuminate, sharply serrate, three-ribbed at the base, on slender petioles; peduncles elongated; heads many-flowered, the ray flowers pistillate, those of the disk tubular, perfect, five-toothed; rays deciduous; scales of the involucre obtuse, in two to three rows, the exterior longer, leafy; chaff of the conical receptacle lanceolate, partly clasping the smooth four-angled truncated achenia; pappus none. Stem two to three feet high. Leaves two to three inches long, sometimes scabrous. (*Chapman's Flora of the Southern United States.* See also Gray's *Manual of the Botany of the Northern United States*, and Wood's *Class-Book of Botany.*)

THIS very showy Asteraceous plant has very little history in the popular sense of the term. Our text-books tell us that its common name is "ox-eye," and it might be supposed that some popular idea was connected with this appellation. But we do not find that the people have this or any common name for it; and on examination we find that "ox-eye" is rather a common generic term, applied to a collection of species once included under the old genus *Buphthalmum*, a name derived from the Greek, and which literally means "ox-eye." In the time of Linnæus our plant was known as *Buphthalmum helianthoides*, or sun-flower leaved ox-eye; and we can thus see how it derived the name proposed for it in our American works. The true distinction between it and *Buphthalmum* was first perceived by Christian Henry Persoon, and the plant was described by him as *Heliopsis* in 1806, the name being made up of two Greek words signifying like the sun, and evidently suggested by its old specific name *helianthoides*. As ox-eye is still retained as

the common name for the whole genus *Buphthalmum*, under which there are a number of species still known; and as the name of ox-eye for our present species is not in common use, it may be well to drop it, and adopt that of "False Sun-flower," a name more related to its present botanical designation.

Its botanical characters render it a very welcome plant to the critical student. As compared with other American allies, it is closely related to the true sun-flowers or *Helianthus* on one side, and the cone-flower or *Rudbeckia* on the other. From *Helianthus* it will be found to differ in the ray flowers being pistillate and bearing seeds, while those of *Helianthus* are barren. Then a difference will be found in the chaff or metamorphosed bracts which are on the receptacle at the base of the little florets. In *Heliopsis* these are very large, persistent, and embrace and almost wholly enclose the florets (Fig. 5); while in the other genus they are dry and membranous, and easily fall. It is in this long, persistent, pointed chaff, as well as in its oblong, conic receptacle, that it approaches *Rudbeckia*. Indeed, when the head is dry and the seeds ripe, the resemblance to this genus is very striking. The chaff, however, though persistent in *Rudbeckia*, is not so hard when dry as in *Heliopsis*. In this genus the florets or little flowers are comparatively large, and well formed for study; and here it may be observed that the multiplication of botanical terms, so necessary for scientific precision in description, may often mislead one as to the true character of the part described. We call the flowers of plants like these, compound flowers, and the order which contains them *Compositæ;* but they are no more compound than those of the *Umbelliferæ* or *Valerianacea*. In the belief that the head of a composite plant was the flower, the smaller parts became "florets;" or the little flowers, which go to make up the great flower. But, in fact, the single parts of the head, as Figs. 2, 3, are just as much perfect flowers as any of their more pretentious sisters in other orders would be. In most of the other orders the form of the corolla is well known to vary, and to give much of the character whereby we distin-

guish one kind from another, and the same will be found true of these little flowers in composite plants. In *Heliopsis lævis* the divisions of the corolla are long and channelled in the centre; but they recurve nearly their whole length, and this gives the flower the appearance of having very short and notched lobes (Fig. 3). The united column of anthers is very long and slender, soon discharges its pollen, and fades away (see Fig. 2); when the deeply divided lobes of the pistil also rapidly recurve in like manner with the lobes of the corolla, as seen in Fig. 3. These little flowers or florets in their several conditions make very beautiful objects in the arrangements of their lines and proportions, as may be noted in our Figs. 2 and 3, and it is doubtful whether any of the more showy representatives of the floral kingdom be better worth an artistic study. As a further point of botanical interest it will be noted that there is not any of the bristly or scaly appendage to the akene usually known as a pappus. The thickened bases of Figs. 1 and 2 are the akenes, and the pappus should arise from what seems to be the joint in the representation, and which is wholly wanting here. This condition occurs at times in other compositæ; but taken together with other points, it aids in forming the generic character.

It is a plant well adapted to cultivation, and gives a gay attraction to the flower garden in August and September. The side flowers are on rather longer peduncles than the central ones, and this brings the flowers all to nearly one level, or, as the botanist would say, it is corymbosely-paniculate. In garden culture it grows from two to three, or sometimes nearly four feet high. It is a perennial plant, and readily increased either by seeds or dividing the root-stocks. Seed sown in the fall will bloom the next year. It seems to have been one of the earliest of our wild flowers to be introduced to English gardens and English botanists, for it is recorded as having been grown in the collection of the Duchess of Beaufort in 1714. It is referred to by the English botanist Ray, who perhaps received it from the Reverend John Banister, who sent to him a catalogue in 1680, with seeds

and drawings of the plants of Virginia. In 1715 we find it noted in the work of another English botanist, Robert Morison, as *Chrysanthemum Virginianum.* Specimens were again sent from Virginia by Clayton to Gronovius, who then supposed it to be a *Helianthus;* but in his later edition of 1742 followed Linnæus in calling it *Buphthalmum.* It has had other synonyms; but except some arising from variations, they are not worth recording here. The chief of these variations is in the roughness of the foliage and involucral scales. In their roughest condition the plant has been known as *H. scabra.* It covers a wide range of territory, extending from Maine to Florida, crossing the Mississippi, and almost reaching the Rocky Mountains. Our drawing was made from a Kansas specimen. In the eastern part of that State it is one of the elements that give so much character to the flowery prairies of tourists' letters.

It is of no known use in the arts, except that of gardening. The roots have a grateful perfume, and might perhaps be put to some good use.

EXPLANATIONS OF THE PLATE.—1. Branchlet, showing the opposite character of the leaves and flower stems. 2. Floret enlarged before the maturity of the anthers. 3. The same subsequent to the maturity of the anthers. 4. Vertical section of the receptacle, showing its conical form, and young scale half embracing the floret. 5. Mature head, showing the persistent scales. 6. Outline of a full-sized leaf.

PENTSTEMON SECUNDIFLORUS.

L. PRANG & COMPANY, BOSTON.

PENTSTEMON SECUNDIFLORUS.

ONE-SIDED PENTSTEMON.

NATURAL ORDER, SCROPHULARIACEÆ.

PENTSTEMON SECUNDIFLORUS, Bentham.—A foot or two high, including the elongated and racemiform strict many-flowered thyrsus: cauline leaves narrowly lanceolate (two or three inches long and lines wide); radical spatulate: peduncles one to three-flowered: sepals ovate or oblong, acute or obtuse, with somewhat scarious but entire margins: corolla with narrow proper tube of nearly twice the length of the calyx, abruptly dilated into the broadly campanulate throat of about one-third inch in height and width; this nearly equalled by the widely spreading lips; the lobes round-oval: sterile filament glabrous or minutely bearded at the dilated tip. (Gray's *Synoptical Flora of North America.* See also Porter's *Flora of Colorado.*)

NEW plants show the great progress of botanical discovery on our continent better than the genus *Pentstemon*, to which our present subject belongs. In the early part of the present century barely a dozen kinds were known. Between 1820 and 1830 the Royal Horticultural Society of London was in a very active condition, and it employed a remarkably acute and energetic collector, Douglas, to explore the Pacific coast in search of novelties that might add to the gayety of English gardens. During the few years that this distinguished man was engaged in this work, he added about twenty new Pentstemons to those already known. Following him came Drummond in Texas, and Nuttall, Fremont, and Long, till in 1845, when De Candolle's "Prodromus," containing the Pentstemons known to that time appeared, fifty-four species were described. In Dr. Gray's "Synoptical Flora of North America," issued in May, 1878, there are no less than seventy named and classified; and there is little doubt but that, as the country becomes still further explored,

more will be added to the list. The species now illustrated, *Pentstemon secundiflorus*, was first found on the second expedition of Fremont, across the continent, in 1843–44, and was given the name it bears by the eminent botanist Bentham, after an examination of a dried specimen of Fremont's collecting from Dr. Torrey's Herbarium, who published it in 1845 in the work of De Candolle's, above cited. The genus is wholly American; one-third of the whole number known being native to California, and most of the others being found in the drier parts of the central regions of our country, chiefly in the Wahsatch and Rocky Mountain regions. The present species was found by Fremont in what is now known as Colorado. It extends southwardly along the mountains of this State into Arizona, and probably into New Mexico, but has not been found outside of this comparatively limited area, though a closely allied species, *Pentstemon acuminatus*, and with which this was once confounded, is found from Colorado across to California. The region of country where this and kindred Pentstemons are found is very dry, and the soil has a barren and parched appearance. Scarcely any of the flowers found there have any fragrance; but a large number are very showy, and give a gay feature to the scenery which enraptures the traveller. The Pentstemons aid particularly in the autumn beauty of this scenery, and especially the species we now describe, which, together with the allied *Pentstemon acuminatus* is one of those most frequently met with. It grows in tufts, having several stems bearing flowers, and these are about eighteen or twenty inches high. Mr. Lunzer's drawing is of a fair average specimen, and from a plant brought by the writer of this from South Park, Colorado.

Many plants of the Rocky mountains, and regions further west, do not thrive well in Eastern gardens; but this one seems to make itself quite at home. A plant has grown, without much care, in an open, sunny place, from 1873 to 1878, when our drawing was made. The lower portions of the root-stock, however, in time become feeble, and it is best to take up and reset the

plants a little deeper than they grew before, every second year or so; and it is a good plan to raise new plants from seed occasionally.

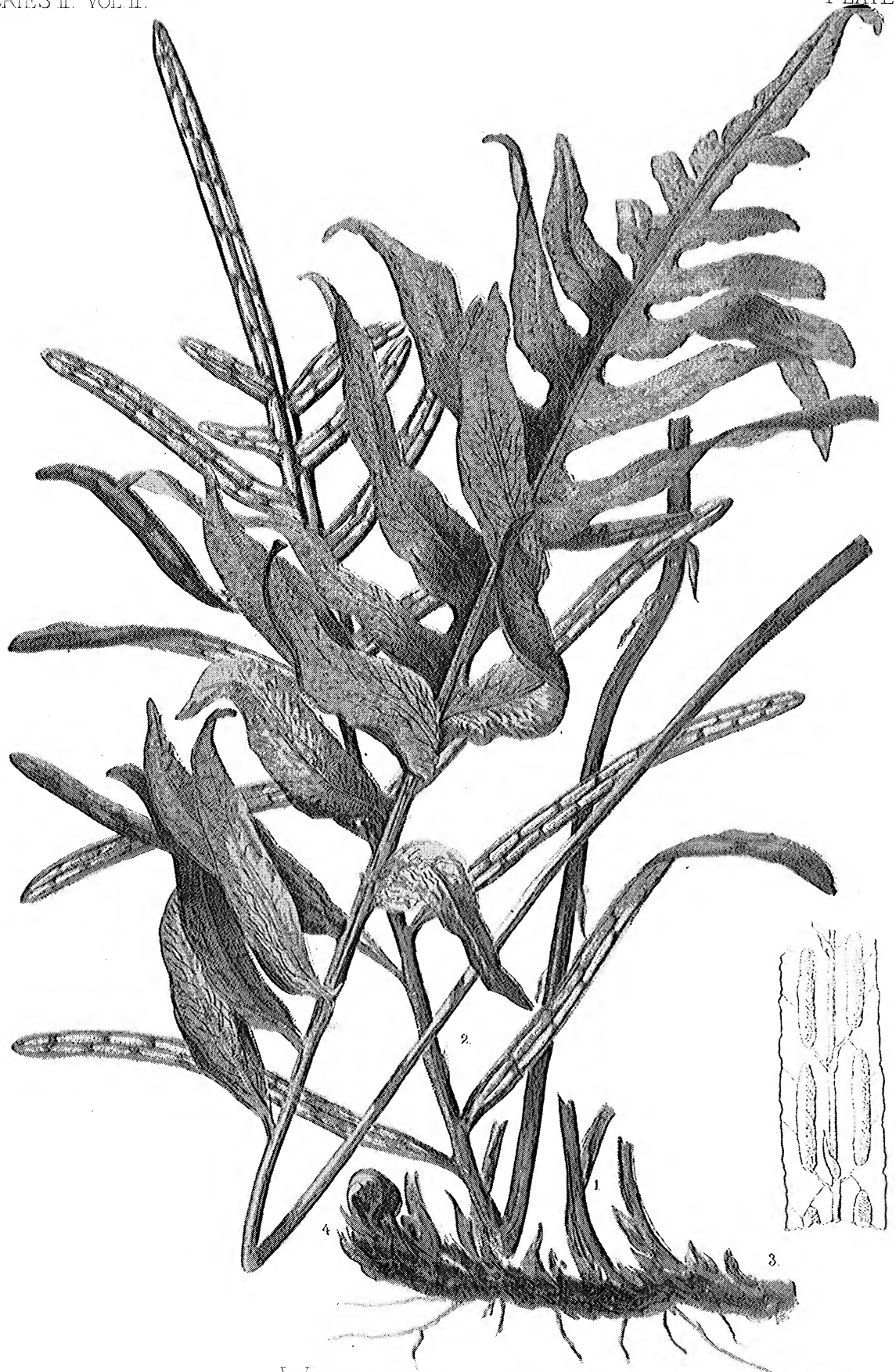
There are some peculiarities in its botanical characters that will interest the general observer. As already noted it was once supposed to be identical with another known as *Pentstemon acuminatus*. But our present species is strongly two-lipped, which Fig. 1 particularly well shows, while the other species has a more nearly regularly divided corolla; and while that has a tube gradually tapering to the throat, the tube in this species tapers abruptly to the throat, as we see in Fig. 2. And then the other species has the flowers arranged regularly around the stem, while this, as we see in our drawing, has all the mouths of the flowers looking towards us, or one-sided—in botanical language they are secund. Why flowers should have this one-sided habit of flowering has not been examined till recently; but there is now good reason to believe that it is because each alternate flower twists in the opposite direction to the other. That is to say that there are two distinct lines of spiral growth in some plants, the one turning to the right, the other to the left, and which must of necessity result in a one-sided raceme. In the transition from leaves to flowers we may also see an interesting form of gradation, by no means uncommon, but yet worth noting in our specimen. The root-leaves and those on the barren shoots, as Fig. 3, are broader at the end than at the base; but as the branch proceeds to form the inflorescence, the apex becomes narrower than the base. It is of course well known that flowers are made up of modified primordial leaves. In our days we are getting an insight into the process, as well as having a knowledge of the fact; and one of these new pieces of knowledge is, that when a petal is formed from an original and, we will say, microscopic leaf, it is generally by a suppression of the elongating part or mid-rib, and a widening of the base. Thus, in an auriculate or eared leaf, it is the auricle, or, in some cases, the stipule, out of which the future petal is formed.

The Pentstemons have mostly showy flowers, among which are found white, scarlet, and purple in innumerable shades. There are few which would be called insignificant. Florists have taken them in hand, and besides the natural species now so numerous, many hybrid forms are found in gardens. In this work Texan and Mexican species have borne the chief part. The Rocky Mountain forms have not been long under cultivation, but will probably be as useful to the florists as their more southern brethren have been. In themselves, however, they have abundant attractions to the lovers of beauty, and the species now illustrated, with its bright, coppery-purple flowers, will be especially welcome.

The writer has found this and kindred species very easily raised from seed in Eastern gardens. It seems, on the whole, best to save the seed till spring, then to sow in a rather open place, but partially shaded until the seeds sprout, when they may have full exposure. The young plants will become very strong the same season, and flower the following summer.

The botanical collector as well as the flower-gardener may have beauty together with dry science in his preserved specimens. If properly attended to during the drying process, the colors are preserved in almost a natural condition, and these Rocky Mountain species especially are among the most attractive members of a botanist's herbarium.

EXPLANATIONS OF THE PLATE.—1. The flower, showing its two-lipped character. 2. Section of the flower, showing its twisted stamens. 3. Barren branch, showing how the lower part of the leaves is narrowed, while the reverse is the case in the leaves of the flower-stem.



WOODWARDIA ANGUSTIFOLIA.

L. PRANG & COMPANY, BOSTON.

WOODWARDIA ANGUSTIFOLIA.

NETTED CHAIN-FERN.

NATURAL ORDER, FILICES.

WOODWARDIA ANGUSTIFOLIA, J. E. Smith.—Sterile and fertile fronds, pinnatifid, unlike; sterile ones twelve to eighteen inches high, with lanceolate serrulate divisions united by a broad wing, having veins forming many rows of meshes; fertile fronds smaller, with narrowly linear almost disconnected divisions; the areoles and fruit dots (which are four to five lines long) in a single row each side of the secondary mid-ribs. (Gray's *Manual of the Botany of the Northern United States.* See also Eaton's *Ferns of North America;* and Wood's *Class-Book of Botany*, under the name of *Woodwardia onocleoides.*)

THE species now illustrated is in many respects one of the most beautiful and interesting of our native ferns. As compared with many other American species, it is regarded as somewhat rare. It is, indeed, confined to a limited portion of our extensive country, but is generally seen in great abundance where it is found at all. In southeastern New Jersey, as we approach the sea-coast, it is seen in great abundance, and aids much in giving the peculiarly pleasing character which renders a visit to that section of the country during the summer months one to be long remembered. The country is low, but a few feet above the sea-level, swampy, and the ligneous vegetation composed chiefly of *Magnolia glauca*, Red Maple, and an occasional specimen of the White Cedar. The smaller shrubs are chiefly of the Alder, *Prinos verticillatus*, *Andromeda*, *Gaylussacia*, *Vaccinium*, with a few scattered Hollies, and some other things. Among and often over this the Mercury vine—*Smilax rotundifolia*—thrusts its long thorny branches, which are assisted by *Ampelopsis* and several species of grape in making an impenetrable thicket often hundreds of acres in extent. Still among

the lowest masses of herbage numbers of smaller things manage to make a fair living. The *Sarracenia purpurea*, or Huntsman's Cup, various strong grasses and sedges, and numerous ferns are almost sure to be among those present, struggling with the *Sphagnum* and other mosses, and quite successfully, for a good share of life. Among this warlike race our netted Chain-fern is found in considerable numbers. It is not, however, that it prefers this sort of a struggle for life, for when it finds itself in places more free from arborescent growths, and has the full benefit of the open air and free sun-light, it is wonderful how much more rich and vigorous its growth becomes.

Besides the beauty which, as a part of the general scenery, it may justly lay claim to, it has individual traits which attract close observation. The barren fronds (Fig. 1) are the first to appear in spring. About mid-summer the fertile fronds (Fig. 2) follow. By autumn the rhizome (Fig. 3) has progressed and formed a terminal coil (Fig. 4), which remains enclosing the buds which are to push forth and form the barren fronds the succeeding spring. The barren frond is remarkable for its resemblance to the Sensitive fern—*Onoclea sensibilis*. From shaded locations, the tint, as seen in our specimen, is rather darker than in others; but when in more open places the peculiar ashen-gray tint is identical with the Sensitive fern. The veining is also the same, but the tendency to division is rather greater in our present species. In the description as taken from Dr. Gray, it is noted that the divisions are united by a broad wing; but this is not completely so in all, for, as may be noted in our illustration, the wing has nearly disappeared at the base of the frond, and, while the upper portion is but pinnately divided, the lower is truly pinnate. The fertile frond is as we see primordially the same as the barren one, even to the irregular divisions of the upper portion, only much more contracted. The masses of fruit arranged like bricks in a wall, and seen enlarged in Fig. 5, add very much to its singular beauty; all of which is heightened by the rich brown color of the stipe, and which is wholly wanting in the

barren one. To the unassisted eye the sori, or fruit masses, look like mere right-angled blocks, but as seen in the magnified sketch they are the outgrowth of veins which, taken in pairs, make oblique hexagons in successive order. Between each pair is a small scale appearing so regularly as to suggest the possibility of these appendages, usually regarded as mere accidents, being abortive intentions of important parts.

The resemblance in the barren frond to *Onoclea* is so close that the philosopher fond of speculation will be tempted to inquire whether the two species may not have had a community of origin. The anatomical structure of the female frond is indeed widely different in the two genera; but we now know that anatomical structure follows and does not govern form. We also know that time in growth-waves has a great influence on form. In *Onoclea* the female frond is not thrown up till late in the season, while in *Woodwardia* it commences growth in midsummer. The *Onoclea* is understood to be of very remote geological age—the *Woodwardia*, from its local range, we may believe to be modern. If, to all these considerations, we may imagine an *Onoclea* that had achieved the power of advancing the female frond, it might result in the change we see. At any rate, we do know such an acceleration would result in a changed form; but we do not know the direction the change would take. Such imaginary plans, suggested by a few observations, must not be taken for facts; but it is only under the inspiration of such possibilities that scientific knowledge is ever advanced.

As already noted, the geographical range of this species is comparatively limited. It is generally believed to be confined to the marshes of the seaboard Atlantic States from Massachusetts to Florida, in which latter State Miss Mary C. Reynolds finds it fruiting profusely. In Dr. Newberry's catalogue of the Plants of Ohio, however, it finds a place, if correctly so placed, probably along the lake region.

Its botanical history dates back to the time of Clayton, the early Virginia botanist, who sent it to Gronovius, by whom it

was classed with *Acrostichum.* By Linnæus it was described as *Acrostichum areolatum*, the latter name being derived from the little areas or pits formed by the uniting veins of the leaves. In 1793 Sir James E. Smith distinguished it from *Acrostichum* and named it *Woodwardia.* He says he had a specimen of our present species given him by Sir George Staunton, who received it first from Pennsylvania. He appears to have seen only the fertile frond, and not to have recognized that it was the same as Linnæus' plant, or he might have called it *Woodwardia areolata*, instead of *angustifolia*, the name it now bears. Comity and the saving of synonyms—points good botanists keep in mind—would have dictated this. Strict law, however, gives the describer of a new genus the absolute right over the name of the species, and this is why the present name is right, though some authors call the plant *Woodwardia areolata.* Willdenow, following Smith, did not seem to like the name because *angustifolia* referred to the fertile frond. He preferred to take a descriptive name from the barren frond—and hence we have in his work *Woodwardia onocleoides.* Good botanists, as we have said, recognize the necessity of adhering to strict canon law. Therefore, so long as the plant is deemed a *Woodwardia*, its correct name will be *Woodwardia angustifolia.*

The Sir George Staunton, who is connected with the history of our fern, practised as a physician in the West Indies from 1762 to 1769, where he was captured in an attack on these islands by the French. He afterwards became celebrated as the English Ambassador to the Court of China about 1792, and died in London in 1801. Many of the leading men of these days were eminent in botanical studies. It would be interesting to know what correspondent Sir George Staunton had in Pennsylvania about that time.

EXPLANATIONS OF THE PLATE.—1. Barren frond taken in May. 2. Fertile frond taken in July. 3. Rhizome. 4. Frondose apex of Rhizome. 5. Enlarged sketch of portion of pinnule, showing the areolate veins and fruit dots.

KALMIA ANGUSTIFOLIA.

L. PRANG & COMPANY, BOSTON.

KALMIA ANGUSTIFOLIA.

DWARF LAUREL.

NATURAL ORDER, ERICACEÆ.

KALMIA ANGUSTIFOLIA, Linnæus.—Stems about two feet high, slender, somewhat branching. Leaves one to two inches long, and about half an inch wide, opposite and ternate, on short petioles, linear-elliptic, paler or slightly russet beneath. Flowers small, bright deep crimson, in lateral corymbs, in the axils of the ternate leaves, and thus appearing verticillate; pedicels filiform, one-third to two-thirds of an inch in length, with two unequal bracts at the base. (Darlington's *Flora Cestrica*. See also Gray's *Manual of the Botany of the Northern United States*, Chapman's *Flora of the Southern United States*, and Wood's *Class-Book of Botany*.)

THIS beautiful genus was dedicated to Peter Kalm by Linnæus in 1751, as our botanical authorities say. In his Journal, under date of November 20, 1748, Kalm, noting a short trip he made from Philadelphia to the house of Peter Rambo, near Gloucester, New Jersey, and referring to the common Laurel, says: "Dr. Linnæus, conformable to the peculiar friendship and goodness which he has always honored me with, has been pleased to call this tree *Kalmia latifolia*." In referring to this plant, Dr. Darlington observes: "With great deference to the decision of Linnæus, this genus of beautiful evergreens is the one which, in my humble opinion, ought to have commemorated the merits of John Bartram, the botanical patriarch of our country." Linnæus, however, named no genus in honor of our early naturalist, nor did any one so honor him during his lifetime. After his decease Gaertner, a German botanist, named for him an East Indian plant, allied to the Linden; but it was found not sufficiently distinct from a genus already established, and is now known as *Triumfetta Bartramia*. At the end of the century

Hedwig named a small moss, *Bartramia*, which stands to this day the worthy memorial of this modest man. Kalm was a great friend of Bartram, as we judge from Kalm's journal, and as a letter from him to John Bartram in Darlington's "Memorials" indicates; and doubtless the good old Quaker botanist was well satisfied that Dr. Linnæus in his peculiar goodness had thus commemorated his friend. Kalm was no common man. He was born in Finland in 1715, and was destined for the church; but after attending a course of lectures by Linnæus, he determined to devote his whole life to the study of natural history. He was subsequently elected Professor of "Economy" in the University of Abo, which, until its destruction by fire, and removal to Helsingfors in 1827, was one of the leading centres of learning in the north of Europe. The Royal Swedish Academy desired to send some one to explore the northern part of the American continent, believing from the similarity of the climate that much good would result to Swedish agriculture and the kindred arts and sciences; and, on the recommendation of Linnæus, Professor Peter Kalm was selected, and a practical gardener, Lars Yungstraem, detailed to accompany him. He sailed from Goettenburg on the 11th of December, 1747; but, touching at Norway, did not reach London till February. He left London on the 15th of August, and arrived in Philadelphia on the 26th of September—a very fair voyage for those days. In 1749 he went through New Jersey, and along the Hudson river to Albany, thence across Lakes George and Champlain to Canada, where, he tells Bartram, in the letter above cited, he was "once not far from thrown in the other world," for he "did go down a river where such Indians did live that do kill all the English they see." Returning against winter to Philadelphia, he made a large shipment of seeds and plants to Sweden, and the next year explored western Pennsylvania, the Blue Mountains, and the coast of New Jersey; and went again through New York to Niagara Falls, returning in October to Philadelphia, starting for England on the 13th of February following, having been nearly four years away. He

resumed his professorship at Abo, and died in 1779, in the 64th year of his age.

Though the genus is dedicated to Kalm, it was known before his day, through Banister, the early Virginian botanist, who made the celebrated Ray acquainted with it; and the species now known as *Kalmia angustifolia* was figured by Plukenet in the early part of the eighteenth century, who acknowledges his indebtedness to Banister. The plants in a living state were first sent to England by Bartram to Collinson in 1730, a little before Kalm's time.

In beauty there are few more striking plants than the "narrow-leaved *Kalmia*." Its sister species, *Kalmia latifolia*, from its stronger growth, makes in the landscape a greater display of its charms; but it will not bear so well as this one the critical tests we may apply to beauty. A poisonous character is attributed to it, which is said to act fatally, especially on sheep and lambs. Mr. D. J. Brown, the author of the "Trees of America," says: "The flowers of *Kalmia angustifolia* are known to produce unwholesome honey;" but he does not give any facts to bear out the assertion. The nearest approach to positive experience at hand is in a work on sheep by Dr. H. S. Randall, an author well known in connection with that subject. He says: "The narrow-leafed, low laurel, *Kalmia angustifolia*, . . . is eaten by sheep, particularly when they are unaccustomed to them, or when they are hungry from travelling, and find these bushes growing by the roadsides." But in another place he observes: "Other plants besides laurel are suspected of poisoning sheep; but very little accurate information has yet been obtained regarding them." It is very likely the reputation is the remains of some early notion which has been repeated by succeeding authors without any personal investigation. John Clayton, in sending to Gronovius in the early part of the last century, remarked, that "an opinion is prevalent that this species is greatly injurious to sheep." It was but an opinion then, and is but little more now. Rafinesque, however, says positively that

the tincture of *Kalmia angustifolia* is so powerful that "a few drops killed a rattlesnake." Elliott, the author of a botany of South Carolina, says that the negroes of that State use a wash of the leaves of this species to cure minute parasites on dogs. Dr. F. Peyre Porcher, in his "Resources of the Southern Fields and Forests," quotes Dr. Torrey for the statement that "the leaves of the *Kalmia* (*angustifolia*) exude a sweet, honey-like juice, which is said when swallowed to bring on a mental intoxication both formidable in its symptoms and long in its duration;" but, except the fact that it exudes a honey-like juice, Dr. Torrey seems to report only what "is said" of it.

In general, there is a remarkable uniformity in the color of the flowers of this species, though in *Kalmia latifolia* there are numberless shades. Willdenow says, however, that it varies with red and with drooping flowers—"*rubris et cernuis;*"—but this is probably one of those errors not unfrequently found in the most carefully edited works. The "Botanical Magazine," figuring the plant in 1796, notes that there was then a pale variety in cultivation as well as the one with deep red flowers, so that flesh-colored and not drooping was probably what Willdenow intended to say. This variation must, however, have been in a special case, as it is probably rarely seen in nature.

In regard to its geographical distribution and peculiar locations, Dr. Gray says, in his "Synoptical Flora of North America," that it grows on "Hill-sides from Newfoundland and Hudson's Bay to the upper part of Georgia;" but though often found on dry hill-sides, and at considerable elevations, it is one of the commonest of plants on the low sandy levels of New Jersey, and in similar places in other States. It extends beyond the Alleghanies into central Ohio and up into Southern Michigan.

In Pennsylvania, from whence the specimen for our illustration was taken, it flowers in June. This seems the date fixed for it by most authors; but in South Carolina, according to Elliott, it is in bloom in April.

SILPHIUM LACINIATUM

L. PRANG & COMPANY, BOSTON.

SILPHIUM LACINIATUM.

COMPASS PLANT.

NATURAL ORDER, COMPOSITÆ.

SILPHIUM LACINIATUM, Linnæus.—Rough-bristly throughout; stem stout (three to six feet high), leafy to the top; leaves pinnately parted, petioled, but dilated and clasping at the base; their divisions lanceolate or linear, acute, cut-lobed or pinnatifid, rarely entire; heads few (one to two inches broad), somewhat racemed; scales of the involucre acute, tapering into long and rigid points; achenia broadly winged and deeply notched. (Gray's *Manual of the Botany of the Northern United States.* See also Chapman's *Flora of the Southern United States,* and Wood's *Class-Book of Botany.*)

THE species now illustrated is a very strong growing plant, often reaching a height of six feet. To get it within the limits of our plate, sections of its most characteristic portions have had to be made, but these are quite sufficient to enable the student to recognize the plant. This is, of course, satisfactory to the botanist, but will scarcely enable the lover of beauty to form an idea of the character of the plant. As it appears in the illustration it is coarse and heavy, and in a lesson in æsthetics might do perhaps to teach the student what to avoid. But it is for all this a plant well worthy of our acquaintance, for its botanical name carries us back a long way into ancient history, while there is so much of its own to attract attention, that it is doubtful whether any plant would do more honor to the selection we have to make among the "Native Flowers and Ferns" for our work.

Silphion is the name applied by Dioscorides, the ancient Greek physician, to a gum-bearing plant, or rather plants; for Bauhin tells us there were two kinds—"the *asa fœtida* and the *asa-dul-*

cis." The juice of the plant was called *laser*, and hence we have *laserpitium* by the Latins, representing the same plant. Modern botanists identify this offensive-smelling gum, the *asafœtida*, with *Ferula Asafœtida* of the East; and the Sweet "asa," or *asa-dulcis*, with *Thapsia garganica*, plants of the Parsley family. The ancient Greeks attributed almost miraculous virtues to these drugs. They were believed to be able to give sight to the blind, and to make old people young again. So famous were they that the physicians from the Libyan country where it grew were widely esteemed, and the princes of Cyrene had a representation of the plant on the reverse of their coins. The drug itself was so precious that it was sold by its weight in gold, from which circumstance it probably derives its name—*asa* being a Greek name for a certain weight or pound—and the two names might be rendered almost literally the "sweet" and the "bitter pound."

When Botany was reorganized by Linnæus, he gave the name of *Silphium* to these plants, it being suggested probably by their odor, which has some resemblance to asafœtida; and it is remarkable that the species now illustrated is said to have powers, though unknown to him, but little, if any, inferior to the drug with which it had but a nominal relationship. A Nebraska correspondent of the Department of Agriculture in 1866 says that growing among the prairie grass, it possesses great medical properties. "Horses fed upon hay, with the polar plant intermixed, are never known to have the heaves. Cattle, sheep, mules and horses, are extremely fond of the heads of the plant while green, as well as when mixed with hay. The pure white resinous gum which they contain performs radical cures in all bronchial cases." The large fleshy roots are a favorite article of food with all the rodents that inhabit the country where the plant grows.

But it is rather in the life-history of the plant than in its family history, or from its medical and economical uses, that its chief interest is centred. It is known as the Polar or Compass plant, because its younger leaves turn their edges north

and south, with the flat surfaces necessarily east and west. When the leaves become heavy, or are blown about by the wind, the north and south direction, though rarely wholly lost, is not so apparent; and this accounts for the doubts of those who have not had the opportunity of watching the growth from its earlier start in spring. In these latter cases the polarity is incontestable. How long this curious fact has been known is not clear. Dr. C. C. Parry, in the Botany of Owen's Geological Survey of Minnesota, published in 1852, refers to it as the "Compass" plant; but whether because this was the name in general use, or because the peculiarities of the plant had been brought to the attention of science a few years before, does not appear. The poet Longfellow, in "Evangeline," issued in 1847, referred to the popular notion, and General Alvord seems to have been the first to attract scientific attention to the plant in 1848. Longfellow's lines are well known. Evangeline is almost in despair at the long absence of her lover, and—

> "'Patience!' the priest would say; "have faith, and thy prayer will be answered;
> Look at this delicate plant that lifts its head from the meadow;
> See how its leaves are turned to the north, as true as the magnet—
> This is the compass-flower, that the finger of God has planted
> Here in the houseless wild, to direct the traveller's journey
> Over the sea-like, pathless, limitless waste of the desert.
> Such in the soul of man is faith. The blossoms of passion,
> Gay and luxuriant flowers, are brighter and fuller of fragrance;
> But they beguile us and lead us astray, and their odor is deadly.
> Only this humble plant can guide us here, and hereafter
> Crown us with asphodel flowers, that are wet with the dews of nepenthe.'"

The reason for this turning of the edge of the leaves to the north and the south has not been satisfactorily determined. Dr. Engelmann, in a paper read before the "American Association for the Advancement of Science," at St. Louis, in 1878, noted that the leaves had stomata on both sides. Plants in general have stomata only on the under surface, and this is taken to mean that stomata do not like light. From this Dr. Engelmann suggested that as the compass plant has these on both sides, there was an evenly balanced struggle to avoid the light, which

would necessarily result in the edge of the leaf being towards the point of greatest light, that is, the meridian. There may be something wrong with this light-abhorring theory; at least, we have only room here to say that many vertical-leaved plants have the stomata on both surfaces, but show no polarity.

In the "Proceedings of the Academy of Natural Sciences of Philadelphia" for 1870, are some detailed facts about the growth of the flowers in the compass plant, which show that growth or the development of a plant is not one continuous process, but proceeds by jerks, rhythms, or waves of varying intensities. The large yellow ray petals close over the disc at night, commencing to expand at 4 in the morning, and becoming horizontal at 6.20. At 4 40 five of the fifteen spiral coils composing the disc commence to grow. The tubular corollas complete their growth by 5.20. The stamens and false pistil keep growing till 5.45, when the stamens stop—the pistil going on till 6 ·5. By 9 in the morning bees arrived, and the florets (which are barren) fell under the touch of the insect, and in their fall fertilized the pistils in the ray florets, which are the only flowers yielding seed.

Its introduction to the notice of European botanists was probably through John Bartram. A letter of Collinson's to him, dated December, 1763, says: "I can tell thee Gordon has raised the fine, stately, broad-leaved Silphium; but thee mentions three fine species from New Virginia, by the Ohio; but which of them ours is I don't know; but thy specimens will set us right." And Linnæus, in the second edition of his "Species Plantarum," published in the same year, says he derived his knowledge of the plant from Collinson, who had it "from Mississippi."

EXPLANATIONS OF THE PLATE.—1. Barren male or disc flower. 2. Scale or involucel from the base of a disc floret. 3. A hair from the stem magnified. 4. Flower longitudinally divided, showing (a) the receptacle, (b) the involucral scales, (c) the fertile ray floret with akene and deeply divided pistil, (d) ray floret from a side view, and (e) barren disc floret. 5. Portion of stem, showing leaf and its insertion. 6. Upper portion of a flowering stem. The whole from an Illinois specimen.

OXYTROPIS LAMBERTI.

L. PRANG & COMPANY, BOSTON.

OXYTROPIS LAMBERTI.

COLORADO LOCO-VETCH.

NATURAL ORDER, LEGUMINOSÆ.

OXYTROPIS LAMBERTI, Pursh.—Silky with fine appressed hairs; leaflets mostly linear; flowers larger (than Oxytropis campestris), purple, violet or sometimes white; pods cartilaginous or firm coriaceous in texture, strictly erect, cylindraceous-lanceolate and long-pointed, almost two-celled by intrusion of the ventral suture. (Gray's *Manual of the Botany of the Northern United States.*)

WHEN the reader notes that the botanical description of this beautiful wild flower is taken from Dr. Gray's *Manual of the Botany of the Northern United States*, which is confined to the "plants east of the Mississippi," he may be told that it is not properly at home in this region, but has merely disregarded geographical lines, and ran over a little into Dr. Gray's territory by way of western Minnesota. It is strictly a Rocky Mountain plant, extending from British America into Texas, leaving the higher elevations occasionally to adorn the plains below. It is wholly confined to this region, and has not even made its way to California as so many of the Colorado plants have done. The flowers of this dry region of our country have little odor, but they are famed for their brilliant colors, by which they give a gay and attractive feature to the otherwise dreary scenery of this inland tract. Among this brilliant assemblage our present species occupies no mean place. It forms tufts in the crevices of the rocks, or generally where the washings from higher places have made little patches of level land; and when it finds itself in these more favorable situations, it will sometimes throw up stems fifteen, or even eighteen, inches high. It is often much shorter than the

specimen we have taken for illustration; but it has always the same showy head of flowers, thrown up above the silvery foliage, so as to be seen even from some distance away. Generally there are but two or three flower stems to a plant, but more are occasionally found. Sometimes the flowers are arranged in a denser head, and at other times more drawn out than in the illustration, and the leaflets are often broader and wider. In past times many of these variations have received distinctive botanical names, such as *Oxytropis Plattensis*, *O. sericea*, and *O. Hookeriana;* but these distinctions are abandoned now. In color there is much variation from purple to rose, and white is said to be not unfrequently met with, though the writer found but one such specimen in several weeks' collecting through South Park. The specimen illustrated was obtained from that place.

In the last century the species now referred to this genus were included among the milk-vetches or *Astragalus*. They were removed from this family in 1802 by Aug. P. De Candolle, who wrote a treatise especially devoted to this little family. Those which he called *Oxytropis* differed from the rest in having a sharp point to the keel or lower portion of the corolla, and which suggested the name for the genus from the Greek *oxys* sharp, and *tropis* keel. It seems a sharp point to found a genus on; but as the various species group well together, it seems sufficient to command general acceptance.

The species we now introduce was the first American of the genus discovered, all the others then known being natives of the old world. In 1825, when De Candolle published the volume of the "Prodromus," containing the order *Leguminosæ*, there were forty-nine species known, but then only this one American among them. Now Mr. Watson, in his "Bibliographical Index," recognizes ten American species. It seems to have been first found by Mr. Thomas Nuttall, the early explorer of our Western country; but it was first named and described by Pursh in his "Flora Americanæ Septentrinalis," issued in London in 1814. Pursh was never beyond the Mississippi; but without much

scruple he seized on the labors of others whenever he had the opportunity, and passed them off as his own. Referring to the way in which he came to the knowledge of this plant Mr. Nuttall says, in his "Genera of North American Plants:" "Mr. Pursh's character is taken from a solitary luxuriant and cultivated specimen, which I obtained from seeds, and is inapplicable in nature;" which is well as affording an opportunity to show how Mr. Pursh became acquainted with the plant; but what is called cultivation does not change the characters of wild flowers to the extent the extract indicates. Our drawing was taken in 1878 from a plant growing in the garden since 1873; and on comparing the drawing with an herbarium specimen gathered in 1873 at the same place, no difference was apparent, not even in size; and this we find to be true in almost all cases. The specific name was given in honor of Mr. Aylmer Bourke Lambert, Vice-President of the Linnæan Society, who was one of the most accomplished botanists of that time. He was indeed the real editor of Pursh's work, and well deserves the honor which this connection of his name with an American plant may bring.

Though so interesting for the beauty it gives to Colorado scenery, it is a dangerous plant to cattle. From a California paper, the "Las Animas Leader," the following paragraph is taken: "This is a good country for cattle, but not for horses. The 'loco-weed' grows here in great abundance; and which when eaten by a horse kills it very soon after. Mr. Sheetz has seen a horse run for about a hundred yards and then drop dead. He believes it is not the plant, but an insect which is found on the under surface of the leaf that does the injury. Little Robe, the Cheyenne Indian chief, says positively that it is the small green insect which does the mischief. Describing the effect Mr. Sheetz says: 'After the animal has eaten the leaves for a little while, the animal seems much exhilarated. It is impossible to handle him. He will not drink water for four or five days. When horses commence to recover, water has to be given to them sparingly. When a horse is 'locoed' it is easily perceived.

Loco is a Spanish word, meaning mad, crack-brained, or foolish, which describes the effects of the weed on horses.'"

As already noted, the *Oxytropis Lamberti* is not recorded as being found by botanists in California, and if it is really not a native there, some other plant must have similar effects, supposing it to be the plant, and not an insect infesting it, which causes the injury. But Professor J. T. Rothrock, the botanist of Wheeler's Survey of the 100th meridian, believes that several kinds have been known as "loco-plants," though this seems to be the one he would pre-eminently give the title to in Colorado. He says: "*Oxytropis Lamberti* in Colorado, and *Astragalus Hornii* and *Astragalus lentiginosus*, variety *Fremontii*, in California, are known as loco-plants. The term *loco*, simply meaning foolish, is applied because of the peculiar form of dementia induced in the animals that are in the habit of eating the plant. In Arizona, I was told the *Hosackia Purshiana* produces effects similar to the above plants, but I have no certain knowledge concerning it." In a note added before the work was finally issued the following observation is made: "The alcoholic extract of this plant failed, when hypodermically injected by Dr. H. C. Wood, to produce poisonous symptoms in the lower animals. He hence concludes it is a mistake to regard the *Oxytropis Lamberti* as one of the 'loco plants.'" Perhaps there may be some foundation for the Indian chief's suggestion that insects have more to do with the dementia than the plant itself; at any rate, it would be pleasant to know that a wild flower we cannot but admire for its beauty is devoid of all noxious qualities.

Its time of blooming seems to extend more or less over the whole season, judging by the reports of those who have found it. Its name occurs among the collections of most of the expeditions that have gone across the continent during the past fifty years, and though these have been at various seasons from June till October, it is generally reported as being gathered in flower.

EXPLANATIONS OF THE PLATE.—1. A complete and average-sized plant. 2. A spike with nearly mature seed vessels, from the same plant.

ASPLENIUM PINNATIFIDUM.

L. PRANG & COMPANY, BOSTON.

ASPLENIUM PINNATIFIDUM.

PINNATIFID SPLEEN-WORT.

NATURAL ORDER, FILICES.

ASPLENIUM PINNATIFIDUM, Nuttall.—Fronds (three to four inches long) lanceolate, pinnatifid, or pinnate below, tapering above into a slender prolongation, "the apex sometimes rooting;" lobes roundish-ovate, obtuse, or the lowest pair long-acuminate; fruit-dots irregular, those next the mid-rib often double, even the slender prolongation fertile. (Gray's *Botany of the Northern United States;* see also Chapman's *Flora of the Southern United States*, Eaton's *Ferns of North America*, Williamson's *Ferns of Kentucky*, and Wood's *Class-Book of Botany* under the name of *Antigramma pinnatifida.*)

WHILE admiring the rare beauty of this little fern as exhibited in our plate the reader may come across Mr. Williamson's remark that "this species is one of the most unattractive of the whole genus," and may pause to inquire whether the first favorable impression be correct. But its true beauty becomes more apparent under a critical examination, and we conclude that Kentucky plants do not grow as pretty as the specimen illustrated, which was taken from the location near Philadelphia where the species was first found. The beauty is of the slender sylph-like type, and yet there is enough of an air of solidity to warrant a more substantial claim. The combination of straight lines with curves is singularly happy; and though the transition from the straight line of the stipe to the curved divisions of the frond is somewhat sudden, this at length gives beauty by the contrast which it makes to the gentle flowing away of the curves into the straight prolongation at the apex. Again, there is real beauty in the gentle passing of the brown into the green at the base of the fronds, while the rich brown color of the fruit dots in

small straight lines is in excellent contrast with the green and curved outline of the divisions of the frond. Of course this effect is heightened by the warm color of the withering fronds, but the beauty of the plant is entitled to full credit for this item, for the artist found them there. Further it may be said that the artistic arrangement of the fronds lends the plant much beauty. The curving of the left-hand lower frond with the brown-dotted under-surface of the upper one, nicely balances the upper-curved and brown under one on the right side, and makes a variation in harmony very pleasant to enjoy. But even here it is only because the artist had what nature afforded him. It is the artist's fidelity to nature which makes the picture beautiful. The fronds would furnish valuable material to designers in ornamental work.

The lovers of plant-life, as well as lovers of mere beauty, will find much to interest them in this little fern. The first leaves of the spring are very small, and as they appear the last season's fronds begin to die. The earliest leaves are but slightly lobed, merely crenate, as the text-books would say. These nearly entire leaves are barren, but other small fronds soon appear, and more deeply cleft, and others successively enlarge till fronds four or five inches in length are formed. The special interest in this fern is that no sooner do the fronds become deeply lobed but the fruit dots appear, no matter how small or how early produced in the season these fronds may be. As we see in our plate a small frond, not one inch in length, is yet covered by fruit dots. Probably no fern known is so enormously productive of spore cases as this species. Now all these points happen to be in striking contrast with another fern with which it was in its early history associated—the *Camptosorus rhizophyllus*. Of this one Michaux says, *fructificatione inordinate sparsis;* that is to say, fruit unusually scarce. And this scarcity of fructification is indeed a well-known character of this, the Walking Fern. Then as regards the lobing, the Walking Fern in its earlier stages has very entire fronds, but as the successive growths increase in size, auricles at the base, and other tendencies to division appear, and it is only as

these tendencies develop that the fronds increase in productiveness. Dr. Chapman, in his Flora, notes that he had seen a form in which the two lower lobes had made prolongations horizontally, in this resembling one of the characters of the Walking Fern. The change of form with approaching productiveness is a very common characteristic in plants. Sometimes with entire leaves in the infertile condition, they become divided in the fertile, and sometimes the reverse is the case ; but the direction of change is always uniform in allied species. It may be surmised from these considerations that *Asplenium pinnatifidum* and *Camptosorus rhizophyllus* on modern theories of development were originally of one parentage, and that the latter with more fertile tendencies assumed those characters which seem inseparable from the more fertile state. This speculation derives more force from the occasional attempts of each to assume characters usually peculiar in the other. The increased tendency to productiveness as the fronds in the Walking Fern become deeper lobed, has already been noted, as well as the tendency to barrenness in our present species when its fronds are entire. In addition to this it sometimes happens that *Asplenium pinnatifidum* comes near "walking" by the formation of a prolongation and the appearance of a small swelling at the end. It is generally doubted that it actually roots at the tip ; but Mr. Eaton observes that he has seen an enlargement at the apex, as if there were an attempt to form a proliferous bud ; and the writer of this once saw a similar case in a plant growing in a green-house, where the prolongation reached over to the ground with the enlargement apparently ready to root, when the frond was accidentally destroyed. Dr. Gray in our description quotes from some source, " the apex sometimes rooting ;" and Mr. John Smith in " Historia Filicum" places it in his division of species actually rooting, and speaks of having had the living plant to observe from. Our plant has straight veins, as seen in our enlarged Fig. 2, while the Walking Fern has netted veins ; but even these characters in ferns are known to be in intimate relations with fertility. There is therefore no reason that we can

draw from analogy against the original identity of parentage of these two very different species; and this consideration gives them an additional interest unusual among plants, wherein grounds for identity of origin often exist without the opportunity for comparison offered here.

The name *Asplenium pinnatifidum* is usually credited to Nuttall, who described it under this name in his "Genera" in 1818. But the plant was known to Muhlenberg, the famous Pennsylvania Botanist, who in 1813 included it in his "catalogue" as *Asplenium rhizophyllum*, variety *pinnatifidum*; by which we see that the only relationship Nuttall has with its history is the expression of his belief that it was a little more distinct from the Walking Fern than Muhlenberg thought it was.

For a long time it was believed to be confined to the rocks of which Nuttall speaks, on the Schuylkill near Philadelphia, and a few places in the South. Even so late as 1870, Professor Gray says in his "School Botany," that "it is very rare." But it is probable that Muhlenberg, before Nuttall's time, had specimens from near his own Lancaster home. Professor Porter has found it there, as well as at Christiana, York, and other places in the State of Pennsylvania. The writer of this found it abundantly on rocks at South Pass, Illinois, in 1865; and Mr. Williamson, in the "Ferns of Kentucky," speaks of it as abundant on the sandstone and limestone rocks of that State. It has been singularly overlooked, and the endeavor to find it in other places than those recorded, may give much zest to the fern-lover's explorations.

EXPLANATIONS OF THE PLATE.—1. A full-sized plant from a cleft in a rock in Fairmount Park, Philadelphia, collected by Mr. Joseph Meehan. 2. An enlarged pinnule showing the veins and fructification.

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